

PERSONAL COMPUTER

EVERY THURSDAY

45p SEPT 1-7 Vol 1 No 26

NEWS

THE COMPLETE COMPUTING WEEKLY

THIS WEEK

DARING DEEDS

All you need to know
about adventure programming

BBC SOFT OPTIONS

Write your own language
with the new BCPL package

THE 64 SERIES

Pull-out Micropaedia puts
the Commodore 64 in focus

TI MEMORY

How to use mini-memory
modules on the TI 99/4A



EVERY WEEK

PCN GAMEPLAY

We put games for top
micros to the test

PCN MICROWAVES

Your hints and tips published here

Microtan - The DIY Micro returns



Pull-out and keep Micropaedia Commodore 64: Part 3

Peripherals, interfaces, sound, graphics and a look at books for your micro.

REGULARS

Monitor 2

Acorn user exhibition report, *page 2*; versatile disk system for Jupiter Ace, *page 3*; Commodore trims business system prices, *page 4*; Grundy looks for Newbrain lifeboat, *page 5*; £95 for an Osborne 1? *page 6*; and programmers win some protection, *page 8*.

PCN Charts 10

Changing fortunes in the micro world plus the best-selling games.

Random Access 13

Readers' letters — your chance to comment or complain.

Routine Inquiries 14

Whatever your problem, we might have the answer.

Readout 16

The new books reviewed.

Microwaves 17

Had a bright idea? Share it with your fellow enthusiasts.

Program Cards 54

In six pages we complete Euro Atlas on the Lynx, begin Asteroid Lander on the Dragon, and feature utilities for the Oric and BBC 'B'.

Clubnet 69

Where to find like-minded enthusiasts.

Databasics 73

Guide to the best-selling software.

Billboard 81

Quit/Datelines 88

Cover illustration by Paul Tupling

MENU

September 1-September 7, 1983 Volume 1 No 26

PCN SPECIALS

Texas arranger

20

Stephen Shaw demonstrates how the TI Mini Memory Module can make your programs in TI Basic more interesting.

Magic and micros

Whatever your computer, write your own adventures with John Noad's swashbuckling series. First of three parts.



22

PCN PRO-TEST: HARDWARE



Raising the Microtan

26

GE Chkiantz reviews the Microtan 65, a DIY micro the users saved from extinction.

PCN PRO-TEST: SOFTWARE

BBC variations

If you'd like to learn more about languages, how about writing your own? Richard King tests BCPL, a package for the Model B that could let you do just that.

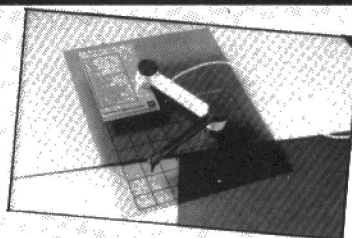


33

PCN PRO-TEST: PERIPHERALS

Trace the Acorn

Richard Blue and David Summerfield outline a digital tracer for the BBC Micro.

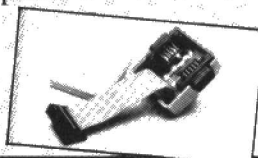


38

Wide screen Pet

41

Is your 40-column CBM cramping your style? Henry Velleman reports on a plug-in board that will double your screen space.



Oric stick-up

43

David Janda gets his hands on one of the first joystick interfaces for the Oric.

GAMEPLAY

Adventuring on the Spectrum with Magic Mountain and Smuggler's Cove.

48

Plus... a round-up of some of the latest releases for the Spectrum.

49

Danger zones on the power grid in Matrix (Commodore 64) and in Ninja Warrior's stamping ground (Dragon 32).

51

Strategic moves with Dallas on the Oric and Call to Arms for the IBM PC.

52

CHARACTER SET EDITORIAL: Editor Cyndy Miles Deputy editor Geof Wheelwright Production editor Keith Parish Managing editor Peter Worlock Sub editor John Lettice News editor David Guest News writers Ralph Bancroft, Sandra Grandison Hardware editor Max Phillips Peripherals editor Ian Scales Features editor Richard King Programs editor Ken Garroch Listings Editor Wendie Pearson Editor's assistant Harriet Arnold Art director Jim Dansie Art Editor David Robinson Assistant art editor Floyd Sayers Publishing manager Mark Eisen Assistant publishing manager Sue Clements ADVERTISING: Advertisement director John Cade Group advertisement manager Duncan Brown Advertisement manager Nic Jones Assistant advertisement manager Mark Satchell Sales executives Ian Whorley, Christian McCarthy, Marie-Therese Bolger, Jan Martin, Julia Dale, Dik Veenman Production manager Eva Wroblewska Advertisement assistant Jenny Dunne Subscription enquiries Gill Stevens Subscription address 53 Frith Street London W1A 2HG 01-439 4242 Editorial address 62 Oxford Street London W1A 2HG 01-636 6890 Advertising address 62 Oxford Street London W1A 2HG 01-323 3211 Published by VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quickset, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper

Cue-in the Electron

For Acorn, the Acorn User Exhibition at London's Cunard Hotel will be memorable for the launch of the Electron. But for the rest of us the most lasting memory could be the interminable queue to get in.

Once inside, there were all the features that make these events so delightful — high temperature and

humidity, walkways designed as single-track roads with passing places, and a ground plan with as much pattern as a broken jigsaw puzzle.

These complaints are only trivial if you didn't attend. The show, after all, should be for your benefit as much as for the exhibitors, and when you've made the trip to Hammersmith, queued and paid, you're entitled to expect some attention. Instead what you find is that the organiser's main concern appears to be to get as many of you

through the doors as possible.

The show was split, part of it on the ground floor and part on the mezzanine. Having queued to get in downstairs you had to queue again to get upstairs.

If you were deterred by the second queue you may have missed the best of the show. There was no single star, although the Electron was undoubtedly one centre of attention. But as in Manchester earlier in the summer (*PCN*, issue 17), there was a wealth of add-on equipment for the BBC and the

Electron. It's a vindication of sorts of private enterprise — the Electron as launched looks limited where software and peripherals are concerned, but the independent suppliers have filled in the holes.

And while they give the Electron a promising start in life, they continue to add to the BBC's repertoire. Several companies, including Pace with a 10Mb hard disk, had disk systems on show for the BBC micro. There is a certain irony in this — Acorn must have looked on the exhibition as a showcase for the Electron, but the BBC took most of the limelight.

Cumana had slim-line drives on show, 5¼in models that sat elegantly alongside its previous full-height versions; elegance may be the key words where this company is concerned because it is about to step out of the BBC micro's shadow and move into the High Street on its own account, complete with fresh corporate identity and logo. Acorn, with its attractive but hackneyed dolly birds, could learn a thing or two in this line as well.



No Entry to the show?



Well, not without standing in a queue for three-quarters of an hour.

Extras for the new baby

The official launch of the Electron brought few clues as to when Acorn will have the extras to make it a complete system — but some of them turned up at the User Exhibition.

During the launch an Acorn spokesman predicted: 'Someone will beat us to it.' Sure enough, at the show two days later was one of the most crucial Electron extras — a Teletext Mode 7 adaptor that will

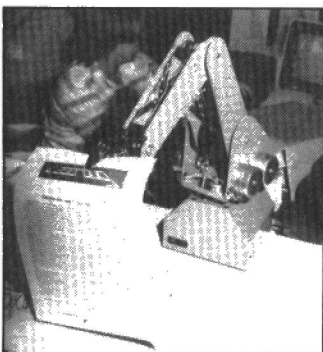


Electron corner on the Acorn stand. enable Electron users to run much of the games software produced for the BBC.

Acorn itself plans to have a second processor for the system next year, and an expansion unit that will include a sideways ROM facility, a cartridge port, RS423 and Centronics interfaces, and an analogue/digital converter.

When this will appear is a moot point. Rumours suggest that even the ingredients for the livid green

Electron cocktail served at the launch will not be generally available for another six months.



Colne Robotics' Armdroid showed off its five axes of rotation on the Laserbug stand.

Pace disk steps out

Pace Disk Systems launched a 10Mb hard disk and the E-Net networking system in a set-up intended for people in education.

Costing just under £2,000, the system gives up to 200 BBC users access to a central disk store. It uses the network interface in the BBC, so that if you are already using a networked system you can transfer to E-Net by fitting a new ROM and installing the hard disk.

Further hard disks can be added, and the command structure of the network permits you to assign a machine as the 'master' with the rest as 'clients', a novel euphemism for the teacher/pupil relationship.

Pace is based in Bradford on (0274) 729306.

The plot thickens

A low cost plotter is due out in September for the BBC micro and will soon be available for other micros too, including the Dragon.

The £283.50 plotter comes complete with cassette software, manual and three pens and can be used to draw anything from geometric shapes and graphs to electronic circuit diagrams. Aimed primarily at education, but suitable for other uses, it has a drill and light sensor and sheets of up to A3 size can be mounted on the plotter's bed.

The plotter is operated by two motors controlled by signals from the micro, driving a small carriage above the flat bed, and will be available only direct until a dealer network is set up.

Parfitt Electronics is in London on (01) 348 1973.

Lightpen at last

The long awaited lightpen from RH Electronics, Cambridge, is now at Acorn dealers, and is available direct for £45.95 including VAT.

The lightpen connects to the BBC, letting you draw lines on the screen or give commands by pointing to a menu. You can also fill in colour with the pen, which is a bit bigger than a felt tip. It has a microswitch and LED lamp, both fully programmable.

It can be adjusted to suit the type and thickness of your screen, and

comes with a package consisting of interface unit, introductory cassette software and user guide. The software is geared to help you adjust the pen, program the micro-switch and LED, and draw on the screen.

Additional software is planned to enhance the pen's capabilities, while the company already has seven new games out, available at Acorn dealers. Prices for these range between £4.95 and £8.95 and a 40 track disk version of lightpen software can also be bought for £5.75.

Master Class, which produces video learning cassettes, has three video cassettes out teaching you how to use the BBC — BBC Introduction and Primary, BBC Basic 2 and BBC Basic 1. One is out for the Electron and two others, about the Spectrum, will be on sale from Smiths as from September. The company hopes to build up a family of ten cassettes for the BBC, and there will be more for both micros in the future.



There were BBC buggies aplenty — this one was £165 from SD Computers.

Disk mix for Ace

An adaptable, if expensive, disk drive, unit is due out for the Jupiter Ace and the Dragon in September from an independent peripherals maker.

Designed and built by Microprocessor Engineering of Southampton, Jet Disk is intended as a universal floppy disk controller. Its system box contains the power supply, one or two internal 3in disks, and the controller board. From this you can hang four further drives.

Marketing manager Steven Pelc says the system will take 3¼in, 3½in, 5¼in or 8in drives, which can be single or double density and single or double sided, with any mixture of them running at any one time.

One 3¼in drive will store 180K and will cost £300, while a second one will be £131.75. Alternatively, you can buy the controller board, interface cable and software for £109.25, enabling you to build your own interface.

Mr Pelc explained: 'If you want to supply your own disk drives instead of buying the box and its power supply, you can buy the guts for it instead, and make your own.' This alternative, he said, would be the obvious choice for people owning micros the company doesn't support.

'The good thing about the system

is the fact that if you change computers, you don't have to buy new disk drives. All you would really need would be a new interface cable and new software,' said Mr Pelc, who added that new software would come out with the Dragon version.

At Jupiter Cantab, marketing manager Geoffrey Walker said: 'We may market these drives, depending on demand.'

On the software side, Mr Walker said Jupiter Cantab was thinking of taking over the Remsoft catalogue.

Versions of Jet Disk for the Jupiter Ace and the Dragon will be on sale direct from Microprocessor Engineering in September, and the

company is developing it for the Spectrum as well as other micros. It can be contacted on 0703-775482.

Microprocessor Engineering's system sidesteps the problems generally encountered by the read/data separator system. The Jet Disk's arrangement, known as a digital phase-lock loop, doesn't require you to get involved in setting it up and the manufacturer says that it will never drift, giving you fast and reliable disk reads.

The board can be set up to be driven by any micro — on-board ROM and RAM sockets take the driver software and Disk buffer for the machine to which the Jet Disk is attached.

CP/M maker casts net into homes

Digital Research, producer of CP/M, is all set to out-manoeuvre Microsoft and its MSX hard/software standard and clean up in the home software market.

The company is due this week to announce products that will spearhead its push into front rooms and kitchens all round the world.

At the core of its strategy is a wide range of operating systems and applications software that will allow programs to be written to run on all home computers.

With its own consumer software the company is aiming away from what it sees as a saturated games market.

'Surveys in the US have shown that people are tired of games and they are now looking for more serious home and educational applications,' said Paul Bailey, director of European operations for Digital Research.

The kind of thing that would be included in the company's range of programs are recipes, diaries and home finance. All the programs should sell for under £30.

To develop its involvement in home computing, Digital Research has set up a new consumer products division to be led by Kenneth Harkness, who was previously president of Atari's arcade division.

Stars of the late show . . .

■ Dragon's own disks (*PCN*, issue 26) are also due next month, substantially later than originally planned.

Dragon is far from being the only micro maker to have had trouble working disks into its catalogue. This is the roll of honour so far:

Computers — Disk drives for the Lynx were due in June (*PCN*, issue 9).

Oric — Seven weeks ago Oric was advertising 3in micro floppies 'with in the next few weeks.'

Other notably late products and services include:

BBC/Acorn — The Ceefax teletext service should have begun in early May.

Acorn — Cartridge software was due in mid-June.

IBM — The XT version of the PC should have been here in quantity in June.

Advance — The IBM-compatible Advance 86 was due June/July.

Laser — Expected in the shops in July.

Corona closes printer gap

By Ian Scales

It seems that even the printer distributors are paying great attention to the price performance gaps which appear on *PCN*'s Printer Pie Charts.

The Smith Corona TP1 printer came off the worst in the recent *PCN* round-up of daisywheel printers.

The major TP1 distributor, Discom Trading Company, decided to lower the price!

The Smith Corona TP1 is now selling at a very reasonable price of £399 including VAT, a drop of £159 from its former price of £558 including VAT. The company says the decision to drop the price was a direct result of our price/performance gap judgement.

'I was sitting in the hairdressers, browsing through *PCN*,' said Stewart Bell, Discom's marketing manager. 'I saw the price/performance gap and decided "fair enough", so we dropped the price.'

The company has advised its dealers of the decision so don't pay any more than you have to — our commiserations to those who went and bought the Smith Corona before the adjustment.

Mice on the loose

By Ian Scales

Mice are beginning to infest the IBM PC — it's almost a plague. The publicity surrounding the launch of the Apple's Lisa has generated enough awareness in micro users to make add-on mice products sellable items.

But the mice available so far come without all the software that made the Lisa such an exciting development.

A mouse is a little hand-sized device connected by a cable to the computer (mouse-tail). By moving it across a flat surface it uses either a roller ball or a bar-code type system on a grid, to move the cursor about the screen. This gives you a concrete way of positioning yourself on the display. Instead of fiddling about with cursor keys, you just move the mouse. It usually has two or three buttons on it as well so you can execute options once you get the cursor where you want it.

PCN will run a special two-part Pro-Test in issues 27 and 28 on two of the mice so far available for the IBM PC. Mouse Systems' Optical Mouse costs £297. It is said to be able to work with just about any applications program for the IBM PC and comes with a set of utilities

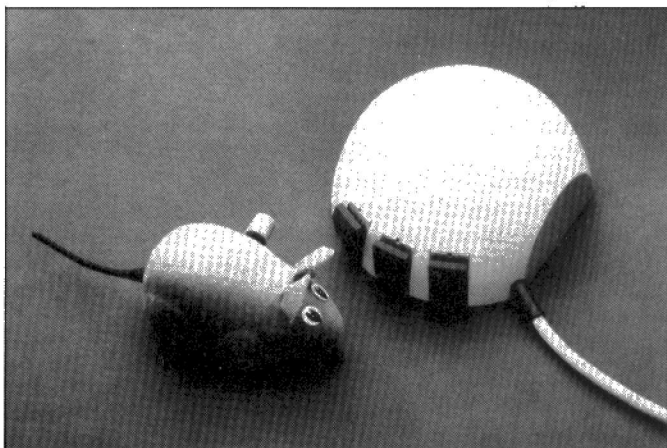
to configure it properly. This one uses an optical reader system and must be used on a special pad where the location information is encoded.

Our other mouse is courtesy of Logitech.

This product uses the alternative of a ball under the mouse to send cursor movement information to the computer. It can be used on any position on a desk top — you don't have to worry about positioning it on a special pad.

Whether these mice are actually worth the considerable sums they cost will be the subject of our second mouse Pro-Test special in issue 28.

Meanwhile the standard-bearer for the legion of mice steadily advancing upon micro-users, the Lisa, is also spawning imitators in other directions. The concept of an integrated software package has been taken up by Vision and Quarterdeck for MSDOS/PC DOS systems, and by individual companies such as Torch.



Logitech's mouse — not spending too much time behind the skirting board.

VIEW FROM AMERICA



War Games babies on the increase

By Chris Rowley

Some things seem dreadfully predictable, even in the fast paced world of microcomputing. For instance there are now surveys that show that, in addition to fear of maths, American girls have a fear of computers. Microcomputers are just 'a boy's thing' apparently. Reaction against computers is strongest in Valley Girl country where anything that involves the use of the brain is decidedly unfashionable this summer.

Equally predictable is the national panic concerning computer vulnerability to pranksters and criminals through phone links and data networks. The surprise summer movie hit was War Games. As is often the way of these things, the movie broke just slightly ahead of the headlines concerning a team of ten teen-computer freaks known as the 414's, after the area code for Milwaukee, their home town.

The 414's began haunting phone-connected computer systems in mid-May, and by June they had logged ten hours' worth of such pursuits and games of blackjack on the big Dec Vax 11/780 at the Sloane Kettering Cancer Institute in New York. To get into the 60-odd systems they succeeded in penetrating, they used the relatively simple manufacturer's 3-digit code words.

Many large system buyers retained such codes after installation to make it easy for the repairmen to get into the system when necessary. Unfortunately the codes are just too easy to crack, and once inside the systems the 414's knew enough to call up menus and alter programs. They were finally apprehended when the computer minders at Los Alamos Nuclear facility noticed that a computer loaded with unclassified science abstracts was getting an awful lot of phone calls. The FBI then closed in on the Milwaukee gang, who now await some sort of retribution, having seen one of their leaders cop immunity in a squeal deal with the FBI.

Interesting irony, especially to Dec, whose machines were by and large the ones tampered with, the 414's arose originally from an eagle scout group sponsored by, you guessed it, IBM!

Public access through simple code is essential for the vast data nets that are spreading through the American business/educational complex. This is the heart of the new Information Industry, beacon of hope for US economy in the 80s. Indeed loads of expensive mainframes were bought in recent years solely for time sharing duties. But public access, which is growing mighty fast with declining prices of micros and modems, is a double-edged proposition.

Considering the spread of 'logic bombing' — a recent case in LA starred two disgruntled programmers at a food distribution concern who phoned a program 'bomb' into the computer system controlling payroll and inventory for 400 Kentucky Fried Chicken franchises. The 'bomb' was timed to crash the main program and erase all memory one month after insertion.

Nor is the telephone the only weak link in US data control. In Virginia an enterprising gent was recently indicted for using a home computer and a microwave antenna to tune into microwave computer lines run by an Atlanta credit bureau. He is said to have ordered up to \$50,000 worth of stuff, right out of thin air as it were.

Yet this is just peanuts; for the big numbers you have to look upscale. To cases like that of the economist at the Federal Reserve, the source of all dollars. He used the name and access code of another employee to tap the Feds' computer for highly classified data concerning the US money supply — information worth millions to the right people.

Out in the research institutes and universities there's widespread computer security paranoia. In the past year there have been hundreds of cases of pranksters, extortion artists and serious spy operations getting into big university mainframes. One result of the growing fear is that sixteen companies are currently listed as offering twenty kinds of code devices to protect computer information. All banks have begun crash programs to encode as much information as possible and all Government agencies have been told to get serious about protecting what's in their computers.

Cuts at CBM

Following its price-cutting at the sharp end of the micro business with the Vic20 and 64 models, Commodore UK has moved the price war up market, with as much as one third off the cost of its business machines.

From today (September 1) the 32K 4032 machine drops £200 to £495, the 80-column version drops £320 to £675 and a 2Mb, dual disk drive drops £400 to £895.

Printer prices have also been cut by as much as a third. For complete systems it means a 32K micro with dual disks and printer which would have cost you more than £2,700 last week should now cost only £1,985.

As a side effect, the price cuts make the Commodore 64 more attractive to would-be business

users. With the business range of peripherals you could build a system of 64K full-colour micro, 2Mb disk unit and a decent dot matrix printer for under £1,500.

Commodore has excluded its topline equipment — the 256K 715, and hard disks — from the cuts, but the cost of the 700 has been trimmed 18 per cent to £650.

Mike Tait, Commodore's national sales manager for business systems, said: 'With the reduced prices Commodore is even more strongly positioned to further expand its established user base of over 110,000 business installations in the UK.'

The cuts coincide with a move to beef up the IBM dealer network.



Systematic reduction — prices of Commodore business set-ups are cut by an average of 25 per cent.

Trade Forum

The Autumn Computer Trade Forum could hold more interest for micro users this year than it has in the past.

Olympia plans to use the forum to give the first UK showing of its 'People' business micro, and Future Computers' FX30 with an integral hard disk should also be there.

Texas Instruments' Professional

will be present, and General Automation is expected to launch its Zebra range of small systems.

The Olympia machine, built around an 8086, may have unusual appeal because it will connect to the company's printers and typewriters. General Automation's Zebras are creatures of a different stripe, coming as stand-alone devices or in clusters of 32. They will also run the Pick operating system or Xenix.

Dawn delayed

By Richard King

More details of the proposed MSX home computer standard (PCN, issue 17) have emerged, but instead of representing a new dawn, it appears to be thoroughly mundane and rooted firmly in the past.

To conform to the MSX standard, a machine must have a Z80 processor, a Texas Instruments TMS9918A graphics controller and a General Instruments AY-3-8910 programmable sound generator.

In other words, an unremarkable processor, graphics which reach cartoon-quality, albeit with some nice bells and whistles, and three rather buzzy noisemakers.

Much more capable circuits are readily available at little or no more cost, and are just as easy to use. The NEC7220 graphics processor is a

good example and is used impressively in the yet-to-be-seen-in-quantity HH Tiger, among others.

There are better sound-generators, too — witness the BBC micro, which uses the Texas 76489 chip; it may be more complex, but it isn't impossible to program.

But the real peculiarity of the US/Japanese MSX spec is its concentration on particular chips. What's wrong with a set of 'driver-programs', which can accept some arbitrary but standard set of commands, and which translate those commands into the correct signals for any suitable alternatives?

There isn't anything new in that idea, either. CP/M uses it.

So the MSX standard won't make any material difference to what you'll see in the shops.

Newbrain to be saved?

'The directors have had no alternative but to take the necessary steps to wind up the company'

*Tony Wheeler,
Finance director,
Grundy Business Systems*

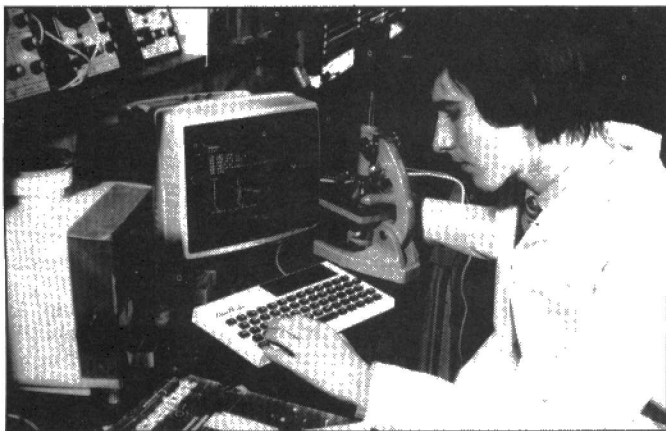
By David Guest

Newbrain manufacturer Grundy Business Systems is foundering with all hands — but so far there is no sign of a rescue attempt to save the stricken machine (*PCN*, issue 25).

The future of the machine that almost became the BBC micro hangs in the balance. Grundy directors are taking the 'necessary steps to wind up the company', and if a rescue is in prospect it looks more like a flotilla of small boats than a full-scale salvage vessel at the moment.

The company's finance director Tony Wheeler said last week: 'The directors are continuing to seek potential purchasers for the business.' No would-be buyers have yet come forward, but rumours are rife — an unnamed US company is said to be ready to step into the breach, and Thorn-EMI, which builds the Newbrain for Grundy, has also been mentioned as a possible buyer.

But the only verbal commitments have come from much smaller companies involved with the Newbrain either as dealers or software suppliers. If their interest is to be translated into action, it needs a co-ordinating effort of the kind the British Technology Group (BTG) could be in the best position to provide.



Development of the CP/M Newbrain and expansion units stretched Grundy.

The BTG owns 30 per cent of Grundy Business Systems, and the rest is owned by the Grundy Group, a diversified organisation that produces almost anything from beer casks to weapons control systems.

A BTG spokesman said: 'As far as we are concerned, we don't feel



Grundy Business Systems boss Robert Smith — the Newbrain is slipping from his grasp.

that we can put more money into the company. It's now up to the private sector to step in.'

The attitude of the Grundy Group has not been publicly expressed. It bought the Newbrain from Newbury Labs in July 1981 for an undisclosed sum, thought to have been close to £600,000 — perhaps significantly, the sale was negotiated by the BTG. Since then the Newbrain has established itself and generated a certain loyalty among dealers and users. But the Newbrain was a late birth (and this may have cost it the BBC's endorsement); the additional features —

a combination of factors: a decline in sales in the first half of this year and the delays in the appearance of the enhanced models.

'The demand from UK dealers and overseas distributors exceeded production by the end of 1982,' he said. 'Production plans were accordingly updated to meet an anticipated growth in sales in 1983, calling for a very substantial increase in working capital. From January 1983, however, sales in fact declined, a situation aggravated by the failure to meet the predicted dates for the introduction of enhanced features, including CP/M systems.'

Unconfirmed reports suggest that Grundy raised its production targets to 10,000 a month earlier this year, basing its predictions on pre-Christmas demand at the end of 1982. The same sources say that Thorn-EMI is still holding large stocks of unsold Newbrains, perhaps as many as 5,000, and that it has components for another 2,000 on its hands.

Ironically, the Newbrain was seen as a good investment in this same period. The BTG commented: 'In the last six to nine months quite a few companies have been looking at the BTG's holding with a view to buying our shares. But they lost interest when promised additions to the Newbrain failed to arrive.'

He added: 'With the release of the disk system there has been renewed interest from some companies who now see the Newbrain as a serious business machine.'

This could come too late unless

the interest can be channelled into a rescue bid, but it would certainly find support from other sources. Systems and software house Kuma last week said it might consider helping in a rescue attempt, and the Newbrain software specialist Elstree Computer Centre went further: 'We would certainly get together with other dealers to save the product, which is very highly rated

'You can't have such a high technology machine just stopping'

*Alan Fish,
Elstree Computer Centre*

by dealers,' said Alan Fish of Elstree.

'I see a big future for the machine because of its high technology,' he said. 'For example, the four character sets, 800K on each disk, and a full 80 column display. The disk system is superb. You can't have such a high technology machine just stopping.'

The system may have a future, but the prospects for Grundy Business Systems staff at Cambridge and Teddington are still uncertain. About 30 people are involved, and one told *PCN* they had been expecting the axe to fall since June.

'A lot of people have been going for interviews since then,' he said. 'It had been on the cards for a while.'

Osborne packs more software

In a special promotion lasting until the end of the year Osborne has brought its prices down to Spectrum level.

The face value of an Osborne 1, you are asked to believe, will be £95 for the rest of the year. But Sir Clive needn't spend too many sleepless nights — the Osborne will cost you £1,495 in a package that includes £1,400 worth of software.

Osborne already includes SuperCalc, Wordstar, CP/M, CBasic and MBasic in the price of its system. The new Osborne 1 Budget Office System will also include Personal Pearl and the Peachtree Business Management system.

Osborne has also repackaged the system to include a hard-disk ver-

sion priced at £2,995. This comes with the Trantor TSL-5 5Mb disk.

And the device that is mainly responsible for these measures, the Executive, is just appearing on the horizon. Since its launch, sales of the Osborne 1 have slumped so badly that Osborne has had to cut back by closing a manufacturing plant in New Jersey.

The Executive is also prompting software houses to bring out adapted facilities. One, 4B Microcentres, has launched a Development System for the machine — in the absence of Osborne's own promised development system.

4B (0295 50796) is selling the Executive plus its UCSD-Pcode development system for £2,395.

More in the business end of Apricot

ACT is beefing up the software to run on its Apricot, due to appear in the shops in October.

It has signed a deal with US software producer Sorcim, which will bring a range of business applications into its portfolio.

These include a new version of the word processor Superwriter

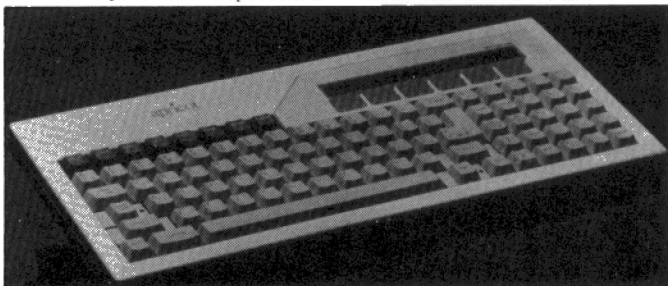
which features a spelling checker working off a 20,000 word dictionary.

It also has a merging facility that lets you print letters selectively or in bulk from a mailing list.

Supercalc 2 will be available for the Apricot as well. ACT says that its formatting has been improved and that it gives you a greater range of options in dealing with the worksheet on the screen.

Superchart is another newcomer to the ACT catalogue; this is a business graphics package.

ACT is on 021-454 8585.



ACT's Apricot — softening up for October launch.

Condor DBs land in UK

Condor has made it across the Atlantic to bring cheap relational database management to European users.

Produced by Condor Corporation, the system is presented as an introduction to sophisticated data-handling techniques. It runs on a variety of systems that includes the Sirius, IBM PC, Apple, Zenith and DEC.

Its distributor in this country, MOM Systems of Aberdeen (0224 571825), is selling it in three versions. At its simplest level it costs £95; for multiple-file work you pay £195 and for a system featuring report writing and similar functions you pay £295.

The first level can be upgraded to the third for £125.

HP loads Context into its Model 16

Hewlett-Packard has achieved something of a coup by offering Context MBA, an integrated business package that previously ran fully only on IBM systems, on its Model 16 business micro.

Developed by Context Management Systems, the package combines a spreadsheet, word processing, graphics, database management and telecommunications facilities. It includes 'windowing', so

that any of its functions can be called on to the screen at any time for analysis; and when a change is made in one part of the software it is automatically incorporated in the rest — even to the extent of graphs automatically re-drawing themselves.

Context MBA uses a workspace of 95 columns and 999 rows — and each cell can hold 8,000 characters. At minimum it needs 512K, but the two HP systems on which it runs offer up to 768K and 2Mb respectively — these are the Series 200 Models 16 and 36.

The package costs £593. Hardware from Hewlett-Packard doesn't come cheap either — an entry-level Model 16 costs £3,878. It is based on the Motorola MC68000, and HP has also announced CP/M-68K.



Hewlett-Packard putting the Model 16 in Context.



ICE IN THE SUN — Flying the flag in one sense, Independent Computer Engineering (ICE) has sold £2½ million worth of equipment to Saudi Arabia. Saudi readers of PCN could soon be using British-built hard disk units, multiplexors and tape streamer back up units from ICE, which is based conveniently close to Heathrow airport at Ashford, Middlesex. But couldn't ICE have shipped its wares out on British Airways?

Techmar vow

Comart has promised not to cast adrift anybody who bought Techmar peripherals from it.

The UK supplier severed its ties with the US peripherals company last week, but a spokesman said that it would continue to support users until Techmar finds another UK distributor.

But any orders already placed will be cancelled and Comart will refund any money paid. 'We will not let our customers down,' said David Slinn, Comart's marketing manager.

Techmar produces add-ons for IBM's Personal Computer. Last summer Comart, with a view to a long-standing relationship, signed an agreement to distribute Techmar's products in the UK. The agreement was announced in conjunction with IBM's PC launch.

Since that time Techmar has expanded. 'I believe that this expansion is part of the trouble', said Mr Slinn. 'The company has obviously had problems with manufacturers, resulting in vast product delays.'

Comart has had difficulty in obtaining promised supplies for UK orders. Some products have taken up to six months to appear. Comart has therefore been unable to give delivery dates, leading to bad feeling with customers. 'We have a reputation to protect,' said Mr Slinn.

Comart believes that Techmar will eventually sort out its problems.

Caroline Alpert, vice president of Techmar, said she feels that the break-up is beneficial to both parties.

CTA to cover authors

The Computer Trade Association (CTA) is extending its clean-up campaign to bring software writers under its protection. After spawning the Guild of Software Houses (*PCN*, issue 24) to give consumers the protection of a code of conduct, it is aiming to bring software producers under a similar umbrella.

The CTA aims to encourage program authors to join in order to set up a professional body of specialised advisors to be called the Society of Software Authors.

Questions already being raised include the matter of whether the software industry is concerned with manufacturing or service. The dif-

ference is quite significant: if you're setting up a manufacturing business you are eligible for one of the highest types of Government grant. This could mean that your first year's rent and rates are free. But if you are setting up a service then this does not apply.

Conversely, anybody writing software from home can only receive monetary assistance if he can prove he is performing a service.

The CTA is aiming to come to an arrangement agreeable to both parties.

It is also setting up a system to monitor all software sales in order

to enforce royalty payments — 'Unscrupulous software houses have been dodging these royalty payments' said CTA general secretary Nigel Backhurst.

Commenting on an article in *PCN*, issue 21 regarding the CTA's plans to protect consumers against mail-order software houses that don't deliver the goods, a small mail-order company, K-RAM, pleads: 'Don't tar us all with the same brush.'

The CTA suggests all software houses take out bonds with insurance companies to ensure that suppliers meet their orders within 56 days or return the customer's

money. Mr Backhurst said: 'If they can't afford to be bonded they shouldn't be in the mail-order field.'

K-RAM agrees that the cost of £50 for a small company seems a fair deal. However, it feels that the suggestion that only leading mail order companies should be approached to implement controls by means of a conference appears unrepresentative.

Part of the CTA's activity recently is little more than a recruitment drive, but it is encouraging to see that some common problems are being addressed in the process.

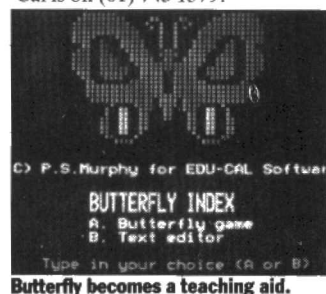
Spelling Beeb

What would Wackford Squeers have made of it — children being taught by a computerised and strictly non-violent butterfly flitting around a screen gathering letters?

This is how a new educational program from Edu-Cal works. For primary school children, it has a butterfly which you guide around the screen collecting numbers and letters to make certain key words.

It runs on the BBC Model B and you can use joysticks as an alternative to the keyboard. Before practising flight simulation with the butterfly you can use another part of the program to develop word lists, stories or mathematical equations for the body of the program.

On cassette *Butterfly* costs £12.50, and on disk £14.50. Edu-Cal is on (01) 743 1579.



TI and Vic 20 deal for Ketts

Owners of Texas Instrument and Vic 20 machines will soon be able to buy software from the local electrical goods shop.

The Ketts chain, which has shops in the Home Counties and the south of England, is following Ruben-below into the software business in a deal with Websters Software.

It will concentrate on software for the TI and Commodore systems, these being the two types of hardware that it supports.

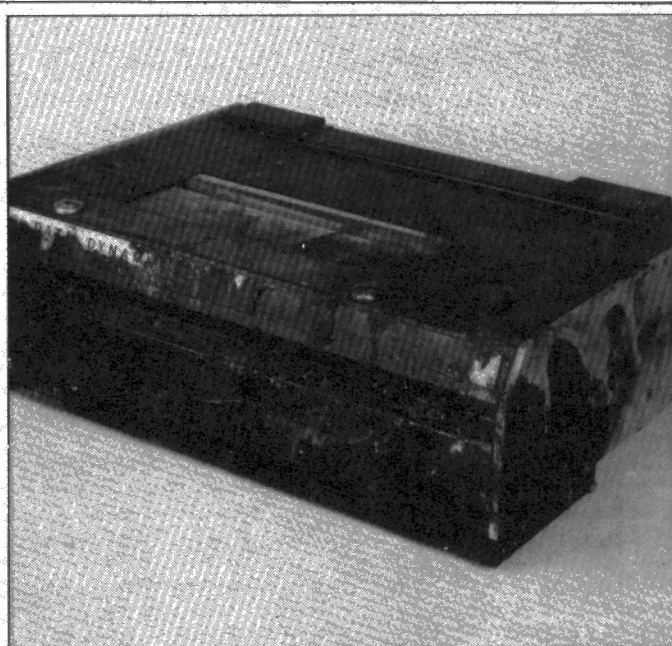
Ile VisiCalc advancement

Visicorp's VisiCalc Advanced Version is now available in the UK for users of the Apple IIe.

The jazzed-up VisiCalc has been out for the Apple III for some time but it has only just been announced by Rapid Terminals (0494 26271) on the IIe. In addition to a standard VisiCalc it will give you variable column-widths, extra help features and the ability to reflect base figures from one worksheet through a number of other worksheets held on disk.

A keystroke memory is also included so that you can set off multiple keystroke operations from a single key depression. Various calculations and output facilities are enhanced in the advanced version.

You'll need at least 128K and a floppy disk, and Rapid recommends — perhaps superfluously — that a printer would be a good idea to get the best out of the software. VisiCalc Advanced Version will set you back £319 from dealers throughout the country.



ZIP FIRELIGHTER — Despite an apparently burnt-out case, the ZIP printer pictured here is still working. According to its manufacturer Data Dynamics, it was involved in an accidental warehouse fire and survived to print out its own tale. Proof, its makers believe, that it is a hot prospect for rough industrial usage. It could be the ideal output partner for DVW's portable Husky, which can often be seen at trade shows operating quite happily under water with only a fish for company.

Executive micro flop

You may regard it as the worst of both worlds but at least you'll have time to prepare for it; by 1988 60 per cent of executives will be working from home.

This figure is culled from a survey by Beta Exhibitions, which also finds that despite the micro boom only one in every two top companies understands the possible impact of technology on its activities. Plenty of them use photocopiers, electronic typewriters and word processors but micros come fourth, and barely 16 per cent intend to invest further in them.

By 1988 this figure may have increased, with the result (again

according to the Beta survey) that offices will have become more congenial places to work — if you are among the other 40 per cent you will be there to appreciate it.

Those working from home will be taking advantage of networking, electronic mailing, and — presumably — cups of real coffee instead of vending machine sludge.

The survey covered 255 of the companies listed in the Times 1000 and Jordan's 'Britain's Top 500 Electronic and Electrical Companies'. These are the very people that the builders of small business systems and PCs that can serve as mainframe network terminals are

trying to lure, and it must be a blow to the manufacturers that only half of them understand the potential of the technology.

Bill Cottle, chairman of Beta, said: 'Given the commercial importance of our sample and the fact that the UK is increasingly an office-based nation, the survey makes worrying reading.'

He takes heart from the widespread plans to install networks, but adds that too many senior executives don't get close to technology — 'In 37 per cent of our top companies directors were not involved in the purchasing of computers.'

ELIMINATE FAULTY CASSETTES

DataClone is the first company in the UK established specifically for the duplication of data cassettes.

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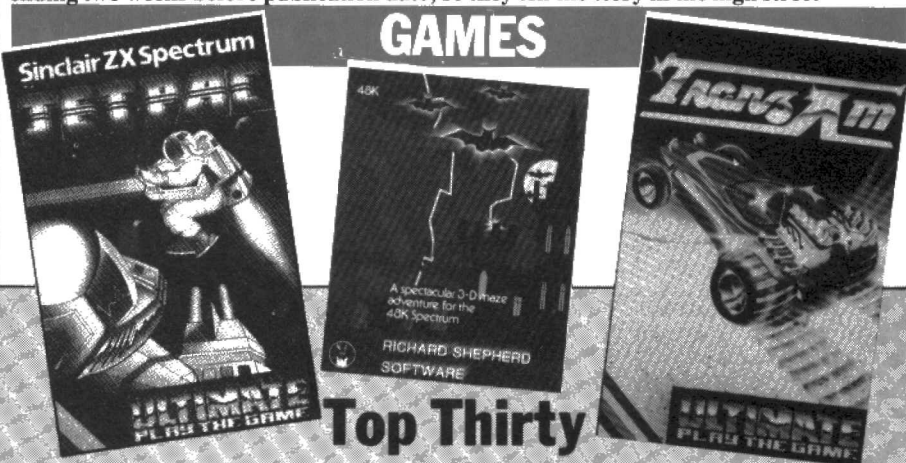


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PCN Charts

You've followed the micro charts — now here's the games top 30 compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the two weeks up to August 18 and, like the micro charts, do not take account of mail order sales.

The micro charts this week show the number of machines sold in the two-week period ending two weeks before publication date, so they tell the story in the high street



Top Thirty

		GAME TITLE	PUBLISHER	MACHINE	PRICE
▶	1 (1)	Jet-Pac	Ultimate	Spectrum	£5.50
▲	2 (5)	Transylvanian Tower	Shepherd	Spectrum	£6.50
▲	3 (7)	Tranz AM	Ultimate	Spectrum	£5.50
▲	4 (—)	Manic Miner	Bug Byte	Spectrum	£6.00
▲	5 (12)	Flight	Psion	Spectrum	£5.95
▶	6 (6)	Terrordaktyl 4D	Melbourne	Spectrum	£5.95
▼	7 (2)	Ah Diddums	Imagine	Spectrum	£5.50
▲	8 (13)	Horace and the Spiders	Psion	Spectrum	£5.95
▶	9 (9)	Killer Gorilla	P. Power	BBC	£7.99
▼	10 (3)	Penetrator	Melbourne	Spectrum	£6.95
▲	11 (—)	Jumpin Jack	Imagine	Spectrum	£5.50
▲	12 (15)	Krazy Kong	Interceptor	Vic 20	£6.00
▼	13 (4)	Arcadia	Imagine	Spectrum	£5.50
▲	14 (—)	Mad Martha	Mikrogen	Spectrum	£6.00
▼	15 (14)	The King	Microdeal	Dragon	£8.00
▲	16 (30)	Monsters in Hell	Softtek	Spectrum	£6.95
▲	17 (27)	Miner 2049er	Big Five	Atari	£29.95
▼	18 (11)	The Hobbit	Melbourne	Spectrum	£14.95
▲	19 (—)	Frogger	Microdeal	Dragon	£8.00
▲	20 (24)	Heathrow ATC	Hewson	Spectrum	£5.50
▼	21 (19)	3D Tanx	DKTronics	Spectrum	£5.50
▼	22 (10)	Psst	Ultimate	Spectrum	£5.50
▼	23 (16)	Zenon 1	IJK	Oric	£5.50
▼	24 (18)	Cookie	Ultimate	Spectrum	£5.50
▼	25 (23)	Gridrunner	Llamasoft	CBM64	£8.50
▼	26 (21)	Timegate	Quicksilver	Spectrum	£6.95
▲	27 (—)	Superspy	Shepherd	Spectrum	£6.50
▲	28 (—)	Knot in 3D	New Generation	Spectrum	£5.50
▲	29 (—)	Test Match	Computer Rentals	Spectrum	£5.50
▲	30 (—)	Scrabble	Psion	Spectrum	£5.95

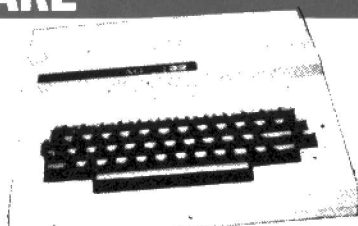
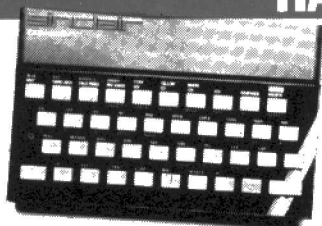
PCN Charts

between August 4 and August 18.

Neither mail order nor deposit-only orders are included and the prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, will be updated every alternate week.

PCN Charts are compiled by MRIB (Computers), London, (01) 408 0250.

HARDWARE



Top Twenty up to £1,000

▶	1	(1)	Spectrum	£99	(SI)
▶	2	(2)	Dragon 32	£175	(DR)
▲	3	(4)	BBC B	£399	(AC)
▼	4	(3)	Vic 20	£150	(CO)
▲	5	(9)	ZX81	£40	(SI)
▶	6	(6)	Atari 800	£300	(AT)
▲	7	(8)	Oric 1	£99	(OR)
▼	8	(5)	Commodore 64	£299	(CO)
▼	9	(7)	Newbrain A	£228	(GR)
▶	10	(10)	Lynx 48	£225	(CA)
▶	11	(11)	Atari 400	£150	(AT)
▶	12	(12)	TI99/4A	£150	(TI)
▲	13	(17)	Apple IIe	£969	(AP)
▲	14	(18)	Sharp MZ80A	£549	(SH)
▼	15	(12)	Colour Genie	£168	(LO)
▼	16	(15)	Tandy Colour	£240	(TA)
▼	17	(16)	Sharp PC1500	£169	(SH)
▼	18	(17)	Epson HX20	£472	(EP)
▲	19	(—)	CGLM5	£150	(CGL)
▼	20	(19)	Aquarius	£99	(MA)

Top Ten over £1,000

▲	1	(2)	IBM PC	£2,392	(IBM)
▼	2	(1)	Sirius 1	£2,525	(ACT)
▶	3	(3)	DEC Rainbow	£2,714	(DEC)
▲	4	(5)	Apple III	£2,780	(AP)
▲	5	(—)	Epson QX10	£1,995	(EP)
▲	6	(7)	HP86A	£1,541	(HP)
▼	7	(4)	Commodore 8096	£1,374	(CO)
▼	8	(6)	Olivetti M20	£2,754	(OL)
▲	9	(—)	Xerox 820	£2,415	(RX)
▼	10	(9)	Televideo TS802	£1,960	(MI)

ACAcorn Computers. ACT — ACT AP — Apple Computer. AT — Atari International. CA — Computers. CGL — Computer Games Ltd. 60 — Commodore. DEC — Digital. DR — Dragon Data. EP — Epson. GR — Grundy Business. HP — Hewlett-Packard. IBM — IBM. JU — Jupiter Cantab. LO — Lowe Electronics. MA — Mattel MI — Midlectron OL — Olivetti. OR — Oric. RX — Rank Xerox. SH — Sharp. SI — Sinclair. TA — Tandy. TI — Texas Instruments.

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LEICESTERSHIRE,
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The CBM 64 explained

I am writing in reply to the letter written by P J Chadwick (*PCN* issue 21).

I would first of all like to say that learning to program with the ZX81 (although I have had no experience) must be unbelievably simple, after all it is an unbelievably simple machine. If any sophistication at all is desired then greater effort is obviously needed, but is very worthwhile.

The manual for the Commodore 64 is sparse but adequate for simple applications. If anything more is desired than the *Programmer's Reference Guide* is ideal. It could be argued that this publication should be included with the CPU.

Anyway, to try to help with a few of your problems, and by the way I am no expert, first of all the operating manual deals with the problem of multiple choice menu's quite satisfactorily (see the 'ON' statement on page 122).

The problem you have with sprites is more than adequately dealt with in the *Programmer's Reference Guide* where 50 pages are devoted to sprite graphics alone.

This number 13 stands for the 13th area in the first bank of 16K memory. Each area of memory is 64 bytes long. Therefore the 13th area of memory starts at location 832 (see page 71 of the operating manual), data is read into memory starting at location 832 and it increments the memory location by 1 each time it is read). The definition POKE 2042, 13 therefore tells the program where the data for the sprite is read for sprite 2.

The significance of area 13 is that this is the start of the cassette buffer and therefore is not needed when a program is running. Therefore you can gain an area of memory for free. However, the cassette buffer can be used only to store data for up to 3 sprites.

ie

POKE 2040,13

S0 data read into 832 →

2041,14

S1 data read into 896 →

2042,15

S2 data read into 960 →

For the storage of data for more than three sprites it is suggested that memory areas 192 to 199 are used for sprites 0-7. This prevents a long Basic program from overwriting the sprite data (or vice-versa), ie



Don't carry a LOAD on your shoulders,
unburden yourself on *PCN*'s letters page.

POKE 2042,192 means that sprite 2 is to get its data from memory area 12288 to 12350 etc.

The four special function keys can be used like any of the keys by defining them in a GET statement, so they can be used to initiate any sequence. There are also toolkit programs that define these keys or allow the user to define them.

The different screen sizes of the Vic 20 and 64 totally precludes the possibility of compatibility. There are twice as many screen PRINT and POKE location on the 64 as there are on the Vic 20. This is a great improvement. Compatibility is less desirable than progress.

I would also like to point out that the manual referred to by the editor is written by Ian Sinclair.

B Rushby,
Great Sutton, South Wirral

Origin labels disabled

So J Nixon of Pinner wants to know why printers cost so much in relation to other bits of hardware? It's very simple really.

As the cost of solid state devices has fallen so fast and so far in the last few years the gap between the products which use them and those which still have a high mechanical content — such as printers, disk drives and video recorders — has widened to such an extent that the printers look expensive.

However, it is well to be careful to specify the base of

comparison when complaining about the cost of an item.

The cost of dot matrix printers with all their flexibility is very good when compared to the printers that home computer users had to put up with only a few years ago.

Mr Nixon is also much mistaken in supporting Mrs Thatcher and at the same time wanting labels on goods to show their country of origin. This is also very simple.

The present Government has presided over the de-industrialisation of Britain to the extent that we will have at the end of this year a trade deficit in manufactured goods for the first time since the industrial revolution. It has also allowed billions of pounds of investment to go overseas to equip the factories of our competitors since the abolition of exchange controls.

It is this which makes the cry for origin labels so pathetic.

I am typing this on a BBC computer of which Mr Nixon is probably proud as a British product. Inside it are chips from Japan, El Salvador, The Philippines and several other odd places — including one from Oldham!

It is impossible to say where computers or other hardware comes from just from the nationality of the company. I understand the new all British Electron is being assembled in the Far East.

Is it still a British machine, Mr Nixon?
S D Scott,
Middleton,
Manchester

Fantastic freak in manual

It's nice to see that *PCN* is giving regular coverage to the NewBrain — a normally much underrated and under-publicised machine. We were pleased that our 'under-a-tenner' assembler/editor, Brainzap, got a good review (*PCN* issue 20) and thought readers would be interested to know why the reviewer had difficulty with the example program.

We discovered that due to a freak occurrence in the printing process an isolated copy had been produced with two important pages half blank. Guess who got it? In the circumstances, we feel three stars for documentation is something of an achievement. It's really not been our week — the day after the review appeared Buzby did his worst and our phone was out of action for four days.

Peter Watkiss,
Watkiss Computers

Beneath the city streets . . .

Some time ago you published a letter (*PCN* issue 18) enquiring why the Sorcerer was missing from your Databasics pages. Your reply was that since the demise of EMG it was not possible to purchase Sorcerors.

May I inform you that CompuDATA of Holland still manufactures Sorcerors and also many add-ons and RAMpacks. In fact the Sorcerer, RAMpacks, disk drives and various other add-ons may be obtained in Britain from Colin Morle, Compusoft, 32 Watchyard Lane, Formby, Liverpool L37 3JU.

Compusoft also supplies a vast range of software for the Sorcerer. It is also the centre for the European Sorcerer Club (ESC) which is still providing a monthly magazine of tips, programs and general information for Sorcerer users. Its readership in fact is worldwide and the British members, though widespread, do meet in small groups from time to time.

EMG has been taken over by a subsidiary of one of the oil companies, which will support the Sorcerer with repairs and maintenance.

Any Sorcerer owner who has problems with repairs can also obtain alternative sources of repair and maintenance from ESC.

R Bumford,
ESC,
Bradford

Lost in a maze of bits and bytes, trapped in a forest of errors, or bugged by Basic? Whatever your problem, access our HELP function . . . better known as Max Phillips.

Write to: Max Phillips, Routine Inquiries, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

Atari in the clear

QI'm having a problem with the school's Atari. In order to complete my program, I want to use a clear command to make the right part of the screen clear with the left side of the screen unaffected during the running of the program. Can you help?

Jim Mickelson, Halesworth

AThe range of values in the FOR . . . NEXT loops represent the area of the screen to be cleared. The routine shown in figure 1 should work in any of the Atari's graphic modes. The pound sign in this program should be keyed in as a hash in order for it to work. The routine can be accessed via a GOSUB 10000 command.

What grows from little Acorns?

QI have a Sinclair ZX81 computer and I am thinking of upgrading to a BBC Model A computer as I can't find any more money for a Model B. But I am scared that when I buy it, the £299 price may drop due to the price wars currently being waged by other micro companies and pressure due to the launch of Acorn's new Electron.

Could you tell me if it would be wise to buy a BBC Model A or wait for developments at Acorn?

Craig Rollason, Binley Woods, Coventry

AIt is never wise to wait for developments at Acorn. Although they can justifiably be praised on many other counts, they are not known for speed.

You should decide whether you really want a Model A or an Electron. Model As are going out of production and are thus not an advisable option, and the Electron will perform much the same functions as the Model A and for two-thirds the price.

The Electron will be expandable to something approaching a fully-kitted BBC Model B — but it will cost more than

```
10000 FOR Y=0 TO 23
10010 COLOR 0
10020 FOR X=10 TO 19
10030 POSITION X,Y: ? £6; " ";
10040 NEXT X
10050 NEXT Y
10060 RETURN
```

Atari screen semi-clear.

buying a BBC micro to begin with. (For more on the Electron see last week's Pro-Test review of the machine.)

As far as a potential price in the BBC micro goes, it's not something you should be too worried about. Acorn has an agreement with the BBC that prevents it from dropping the price on the BBC to any significant degree. And given the vast number of machines they're currently selling, there is no real incentive to drop the price.

The Electron, however, is an all-Acorn affair and the company will be able to do all the price-warring it wants with its new machine — which is currently tagged at £199.

Language debate

QPlease settle an argument between a school friend and I.

What language does the Atari Video Games console use? My friend says 'Mega-Forth', but I don't believe such a language exists. Who is right?

By the way, just a quick word about the recent coupon scheme you ran for Spectrum owners. It was worth saving up for and I bought 'Frenzy', which I really recommend. Keep up the good work.

Douglas Lithgow, Hamilton, Scotland

AI'm afraid no-one wins this argument. Although Atari VCS games machine cartridges are not programmed in Mega-Forth — but in 6502 processor machine code — they are often developed on mainframe computers that could well use a form of the Forth programming language.

The Atari VCS unit uses a downgraded 6502 processor called the 6507, which is similar enough for Atari programs to be developed in Forth language on a mainframe and then translated into 6502 machine code in

order to be implemented on the Atari. The Atari games machine doesn't have a language like Basic built into it, so the only way it can be programmed is in machine code through the processor.

Atari and some third party manufacturers have announced plans for a keyboard to upgrade the games machine to a programmable computer running Basic. Atari is releasing an upgrade called the Graduate, while a company called SpectraVideo is planning a competing version of the add-on keyboard.

They will probably sell for between £50 and £100. The keyboards should include a Basic chip and some sort of cassette interface to allow you to program the VCS in Basic (and perhaps later, even Forth).

Can 64 go into Vic 20?

I am 14-years-old and am about to buy a Vic 20. I would like to know whether Commodore 64 programs that have no POKE statements will work on a Vic 20. I have seen many 64 programs like this.

Sean Hinks, Havant, Hants.

AIf last week's Micropeadia (*Commodore 64, Part 2, page 193, Translating from Vic to 64*) didn't answer your question — here's another short answer: maybe.

If the 64 programs are written in simple Commodore Basic and don't have commands dealing with the screen or PEEKing and POKEing around in memory then you are in luck to start with.

In fact, you may be able to type them in and have them run straight off. However, you'll want things like PRINT statements, as the screen resolution on the Vic is different from that of the 64.

You'll have problems,

however, if you try to load 64 games on the Vic. The machines load and save at different speeds so you'll probably just get nothing when you try to read a 64 program on a Vic.

But Commodore has claimed disk compatibility between its machines, so you might be able to load 64 disk programs onto a Vic and modify them — but who's got a Vic disk drive?

Spectrum's amazing greys

QSix months ago I purchased a 16K ZX81 hoping to upgrade later to a 48K Spectrum. However, I recently found out that we will not be getting a colour television as expected.

Will I be able to run colour software, and if so will it come out in lots of shades of grey or in black and white at the computer's discretion?

Would I be able to manipulate shades of grey using machine code?

And if I cannot get shading in any way, are there any peripherals to do this? If so, are they reversible?

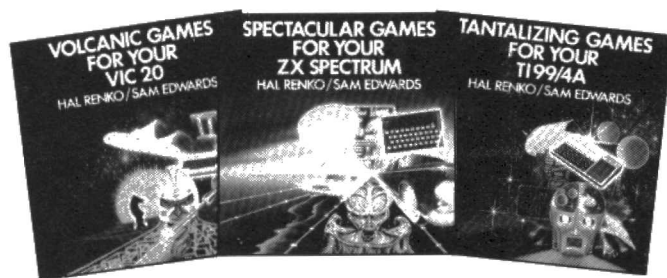
M P Houseley, Havant, Hants.

AThe first thing we ought to establish is that the signal goes from the computer to the TV, and not vice versa. Therefore, as far as your Spectrum is concerned, you can be connected up to black and white, colour or fridge-freezer. It just produces the output, and it's up to you and your output device what you do with it.

Therefore, what you get on your black and white TV when you run colour software is jolly similar to what you get when you use said TV to watch colour TV programmes — shades of grey. This can lead to problems — try using red print on a black background, for example — but in general the shades of grey are sufficiently differentiated to allow you to see what you're doing.

You won't need machine code to manipulate colour, as the Spectrum's INK and PAPER commands will do this. The INVERSE command will give you reversals, so you shouldn't have any great problems with black and white.

Which book would your micro want you to buy? PCN's review page helps you to choose.



'Spectacular Games for your ZX Spectrum', 'Volcanic Games for your Vic 20', 'Tantalizing Games for your TI99/4A' by Hal Renko and Sam Edwards, published by Addison-Wesley at £3.95 each (paperback, 132 pages).

Three identical books — only the listings have been changed to be machine specific. The common word, you will have noticed, is 'games', and rather poor they are too.

All the old favourites are here under assumed names, Fruit Machine, a version of Simon, a few variants of Noughts and Crosses. On a brighter note, the longer listings look more worthwhile, with a reasonable adventure and an original game called

New York New York which gives you the task of controlling traffic in the streets of the metropolis.

It would be as well to get someone else to type in the adventure if you plan to play it, as entering the listing will give away much of the pleasure.

On the whole, these books hardly seem worth the price, and the effort of entering the listings should only be considered if you absolutely cannot afford a couple of reasonable game cassettes.

Alternatively, you could invest the money if you are in search of programming ideas, although there is no documentation of the listings in these books. **PW**

'Logo Programming' by Peter Ross, published by Addison-Wesley at £7.95 (paperback, 249 pages).

It's debatable whether or not *Logo Programming* will actually get to the audience for which it's best suited. Books about alternative micro languages tend to be seen by people who already know something about programming, but Mr Ross' book is eminently suitable for novices.

In fact, *Logo Programming*

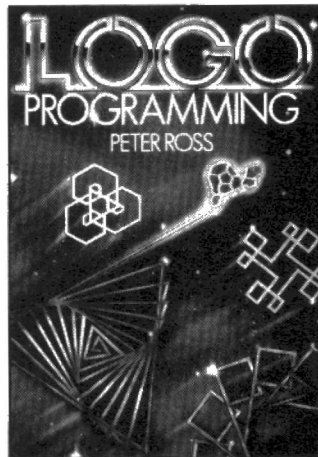
would be a good way to start programming Logo as a first language. In that sense it's useful for micro buyers in general, as well as for staff and pupils in schools.

That said, the book doesn't really achieve its stated aims. In the first chapter Mr Ross says he does not aim purely to teach people how to read and write Logo, and that his book *does* aim to help people develop the knowledge and expertise to be able to make the most of Logo as a tool.

Paradoxically, the book as completed seems to be a particularly clear and readable introduction to Logo programming, but fades out once Mr Ross talks about Logo as a tool!

The language used throughout the book is Apple Terrapin Logo, but there is an appendix dealing with Tandy Radio Shack Color Logo, and the concepts of the language are so simple that the machine-specific hurdle is easy to surmount.

My only real complaint about the book is that the typeface used is particularly gruesome. **JL**



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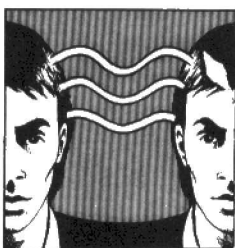
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Creative cursor for the Tandy

Here are a few tips I think will be of use to TRS80 owners. From J and D Bird's Flashing Cursor program (*PCN, issue 11*), these modifications can be made after running the program:

POKE 32764, 120 turns the cursor off.
POKE 32764, 119 turns the cursor on.
POKE 32766, 240 for fast flash.
POKE 32766, 245 for normal rate flash.

To choose which character you want flashing, use POKE 32763, 159 — CHR\$ code for non-graphical characters, and POKE 32763, 159 + (192 — CHR\$ code).

If you wish to be secretive about your programs why not disable the LIST command? Use the following: POKE 16863, 195: POKE 16864, 144: POKE 16865, 0.

To re-enable the LIST, POKE 16863, 192.

Peter Welch,
Wollaton, Nottingham

Make your Lynx scroll over

One of the problems with the Lynx is the lack of scrolling. This can be a disadvantage in a text type program when you might want more than one message to appear on the screen at a time.

The following routine allows the last two or more messages to appear at the same time depending on the number you want and the size of each message.

First dimension a small array (M) with the number of dimensions being the number of messages you want to appear at

a time. The array is initialised with all elements at zero.

All messages should be in a procedure and referenced by a number.

The procedure is as follows:

```
5000 DEFPROC MESSAGE
5010 M(0)=M(1),
      M(1)=M(2), M(2)=M
5020 CLS
5030 GOSUB 5100+M(0)*30
5040 GOSUB 5100+M(1)*30
5050 GOSUB 5100+M(2)*30
5060 ENDPROC
5100 PRINT
5110 PRINT
5120 RETURN
5130 PRINT
5140 PRINT "THIS IS
      MESSAGE NO 1"
5150 RETURN
5160 PRINT
5170 PRINT "THIS IS
      MESSAGE NO 2"
5180 RETURN
```

This can be extended as much as is required, each message taking three lines. The first (lines 5100-5120) being a blank message:

K P Walker,
Hamilton, Lanarkshire

Jupiter Ace on the RUN

I was very surprised to read the letter from Ralph Lorenz (*PCN, issue 18*), who claims that by defining a word:

: AUTO SAVE RUN;
on the Jupiter Ace, you can make your programs auto-run on loading.

I have tried many times to get my programs to auto-run by using routines similar to this and not one of them has worked. It leads me to wonder whether Ralph has a later version of the ROM.

Once the program has been saved it will run, because the SAVE routine is called from within the word AUTO. However, when you reload the program, you are calling the LOAD routine from within the outer interpreter (the ROM routine which reads the keyboard and scans the input buffer, which starts at address 1266 or 04F2 hex). On successful loading a jump is made back to the outer interpreter routine at 1273 (04F9 hex) which prints 'OK' and then proceeds to scan the input buffer which, unless you typed anything after LOAD 'NAME', is empty.

The only way round this that I've found is to BSAVE the whole dictionary using 8192

```
5 REM **** DEMONSTRATION PROGRAM FOR DECIMAL PRINTING ****
10 INPUT N: X=N
20 GOSUB 9000: REM **** CALL FORMATING SUBROUTINE ****
30 PRINT "E"; V$
40 END
9999 REM **** DECIMAL FORMATING SUBROUTINE BY D.E.F. ROLFE 1983 ****
9000 Z$=STR$(X): V$="" : X$=RIGHT$(Z$,3) : V$=V$+Z$
9010 IF MID$(X$,1,1)="" : THEN V$=V$+" " : GOTO 9040
9020 IF MID$(X$,2,1)="" : THEN V$=V$+"." : GOTO 9040
9030 V$=V$+"00" : GOTO 9040
9040 V$=RIGHT$(V$,10) : RETURN
```

Formatted CBM print — see *Straight to the Point*

HERE OVER — BSAVE 'NAME'. You now have the problem that the character set gets corrupted. To get around this, enter the following:
: COPY 14278 DO IC@C,
LOOP 253C,233C,;
CREATE RESTORE COPY
REDEFINE COPY

Now, assuming the word that runs your program is called RUN, edit it to read : RUN FAST RESTORE CALL etc., then type in 8192 **HERE OVER — BSAVE 'NAME' RUN** and your program can be reloaded using 00 **BLOAD 'NAME'** and it will auto-run.

The word COPY copies up the ROM routine at address 78 (4E hex) which sets up the character set on system initialisation, including all graphics characters.

Garry Knight,
London SE10

A sound idea for correction

Since the Lynx checks lines of Basic for errors as they are entered, it is necessary for the user to check that each line has not been rejected, before entering a new one. This considerably slows down the entry process and is tiring on the eyes.

How much nicer it would be if the computer made an audible, rather than purely visual, fuss over errors. Try this piece of machine code. Enter the monitor and type the following:
M 6282 F5 3E 07 CF F1 C9 18
F8 (return).

To turn this off you can POKE &6288, &C9, and to restore it POKE &6288, &18. The code will disappear after NEW and has the disadvantage of not allowing the use of the functions USER2 and USER3 which were formerly 'NOT YET IMPLEMENTED'.

To speed up computer response and printing, type DPOKE &622F, &25B. This stops the computer from clearing every new-line.

DPOKE &62FF, &3518 puts things back to normal.

Jon Chalmers,
Godstone, Surrey

Straight to the point

This short subroutine in CBM Basic will provide a substitute for PRINT USING on any Commodore machine without this useful function.

The variable X is the number to be formatted, the subroutine returns a string V\$, which is the formatted number. If X is a total it is desirable to round up or down to two decimal places using the expression $X = \text{INT}(X * 100 + .5) / 100$, the maximum number of characters in V\$ is 10, including the decimal point, eg 9999999.09.

D E Rolfe,
Byfleet, Surrey

Converted with a Sharp POKE

There is a very easy way of converting POKE codes to ASCII on the Sharp MZ80K. All you do is enter PRINT CHR\$ (PEEK (3270+N)) where N is the POKE code.

Before you try this, you must switch off the PEEK protect with POKE 8048,1 for disk Basic, or POKE 10167,1 for tape Basic.

A simple screen dump would be:

```
10 FOR T = 53248 TO 54247:
PRINT/CHR$(PEEK
(3270 + PEEK(T)));
20 E = E + 1: IF E = 40 THEN
E = 0: PRINT/P
30 NEXT
```

Stephen Godfrey,
Hayling Island, Hants

CLOADing time on the Dragon

On the Dragon, the equivalent of the Basic command CLOAD in machine code is a routine called from the ROM at address 46800. When using this command the program name is immaterial.

Two other useful locations are 32789 and 32792 which, when executed, turn the cassette relay on and off respectively.

Nicholas Dyson,
Irchester, Northants

Plug in the TI Mini Memory Module and your Basic programming takes off, says Stephen Shaw.

TI memory jogger

The TI Mini Memory Module may be used as a file for data or programs; as a means of writing and running machine code programs; or as a means of extending the features of TI Basic. It is this last facility that we are about to look into.

When the Mini Memory Module is inserted into the cartridge slot, what difference does it make to programs in TI Basic?

Seven new commands are added, five of which are relevant to programs in TI Basic: CALL LOAD, CALL PEEK, CALL POKEV, CALL PEEKV, and CALL CHARPAT. The other two, CALL UNIT and CALL LINK, are concerned only with assembly-language programming.

CHARPAT is used to return to a string variable the current definition of a character. For example:

CALL CHARPAT (65,A\$)
will place the string '003844447C444444' into the variable A\$.

It is also possible to use the subprogram to return several definitions in one go:

CALL CHARPAT (65,A\$, 66, B\$, 67, C\$, 68, D\$, 69, E\$) and so on.

By being able to return a character definition in this way, it is possible for a program to return a character on the screen using CALL GCHAR and then, using CALL CHARPAT, to return the definition. The program can then modify the definition.

This can be used in a pseudo high-resolution drawing routine, where characters are continually redefined as the cursor is directed around the screen.

The other four commands are of great interest, as they permit you to look at and amend the contents of the machine's memory.

In TI Basic, the program resides in visual display processor RAM, and the Mini Memory command CALL PEEKV provides the only way to look at this area of memory.

The console has '16K of RAM' but this is not directly accessible to the CPU. The on-board RAM is controlled by the visual display processor (VDP) and the CPU has access to only two bytes at a time.

In issue 8 of PCN I gave a program to investigate the storage of programs in the Expansion Memory. Here is a program to look at programs stored in Mini Memory.

If you have a disk controller, it should be switched off before you switch the console on, as memory is otherwise used differently.

Key in the program in this order and do not edit it.

```
100 REM PCN
110 A=B+2
120 C$=D$&"E"
130 FOR I=16383 TO 16350 STEP -1
```

```
140 CALL PEEKV (I, V)
150 PRINT I; V; CHR$(V)
160 NEXT I
```

Here is the result:

MEM	VAL	MEANING
16383	0	END OF LINE
16382	32	SPACE
16381	78	N (ASCII CODE)
16380	67	C
16379	80	P
16378	32	SPACE
16377	154	code for REM
16376	7	Length of line
16375	0	END OF LINE
16374	50	2
16373	1	ABOVE NUMBER HAS ONE DIGIT
16372	200	Next byte is length of a number
16371	193	+
16370	66	B
16369	190	=
16368	65	A
16367	8	Length of line
16366	0	END OF LINE
16365	69	E
16364	1	Above string has one letter
16363	199	Next byte is length of a string
16362	184	& (concatenation)
16361	36	\$
16360	68	D
16359	190	=
16358	36	\$
16357	67	C
16356	10	Length of line

'A program can, with care, write a new program over itself'

The above represents the code for the first three lines of the program.

If you compare the above result with the similar list in PCN issue 8, it is interesting to note that TI Basic has added a space after the REM text of line 100.

Once the means has been provided to look at the program in memory, it is possible to amend the program: a program can, with care, write a completely new program over itself.

Here is an example. Type in the following program in this order:

```
100 REM PCN
110 CALL POKEV (16379, 77, 65, 71)
Before you RUN the program, LIST it.
Now RUN it and LIST it again: notice any change?
```

This is a very simple example, but the

means has been provided to carry out some very serious programming.

You will note the instruction not to edit these examples: the computer holds the program lines in the order that they are keyed in. Try the above two-line program again, but before you RUN it, edit the first line to read say PCW, and try again.

The computer can find its way about the program lines by means of a line index, which appears below the program in memory. If you are rewriting a program line using POKEV, you must either ensure the new line occupies the SAME number of bytes as the old one, or you face the task of rewriting the line index as well.

Extended Basic uses a different memory map from TI Basic. When TI Basic is selected, some of the memory used by sprites is not in use, and it is possible to POKEV values there to provide limited sprites using TI Basic.

The TI Basic interpreter does not recognise sprites, and in some instances you could cause a system lock-out. If you do, switch off and start again.

The examples given below will work without fuss.

Sprite information is divided into three areas of memory:

- Initial position
- Velocity
- How many sprites are moving?

The initial positions of the sprites are kept in an area of memory which is above the TI Basic screen map but below the TI Basic colour tables. There is enough unused memory for three sprites to be defined.

The velocity values are kept in an area used by TI Basic for the value stack, but it is possible to push the stack down by redefining characters, to leave the velocities free from stack interference.

The number of sprites moving is loaded in the small CPU RAM in the CPU.

Here is a simple example, placing one sprite on screen and moving it:

```
100 CALL CLEAR
200 CALL PEEKV (768,98,128,161,1,208)
300 CALL POKEV (1920,20,20)
400 CALL LOAD (-31878,1)
500 GOTO 500
```

Line 200 defines the initial sprite position, its colour and shape: 768 is the base address in memory, 98 and 128 are the position in pixel row and column (192 pixel rows and 255 pixel columns represent the full screen); 161 is the character. The equivalent ASCII code is arrived at by subtracting 96: hence 161 is character 'A'. The offset is always 96. The figure 1 is the sprite colour. Use the standard colour codes, but deduct 1: the 1 here is colour 2; 208 must always appear at the end of the sprite POKEV, whether one, two or three

TEXAS ARRANGER

sprites are defined.

Line 300 provides the sprite with a velocity: 1920 is the base address, and each sprite then occupies four bytes. The last two are used by the computer and can be loaded as zeros in the POKEV. The two values are row and column velocities from 0 to 255, which represent -127 to +128 in Extended Basic.

Line 400 tells the CPU that one sprite should be moved.

For more than one sprite, the equivalent lines would be:

```
200 CALL POKEV (768,98,128,161,1,
88,128,162,2,95,156,163,3,208)
and
300 CALL POKEV (1930,50,50,0,0,
130,2,0,0,5,140)
and
400 CALL LOAD (-31878,3)
```

Here are some sample programs to try:

```
100 CALL CLEAR
110 MEM=768
120 FOR X=0 TO 3
130 CALL POKEV (MEM+X*4,20+
X*3,140-X*9,161+X,X)
140 NEXT X
150 CALL POKEV (780,208)
160 GOTO 160
```

```
100 CALL CLEAR
110 FOR T=1 TO 150
120 CALL POKEV (768,30+T,40+T/
2,161+T/2,(T/10)+1,208)
130 NEXT T
```

If you wish to use moving sprites in a TI Basic program, first define the following characters:

```
100 FOR T=96 TO 159
110 CALL CHAR (T, "O")
120 NEXT T
```

Characters up to 140 or so can be subsequently redefined without halting your sprites. The other null definitions serve to keep the variable stack from growing so that it overwrites the data, thus halting your sprites or crashing your program.

The screen resides in VDP RAM 0 to 767, but using POKEV is no faster than using CALL HCHAR.

The Colour Table follows the screen, and TI says it starts at 768. In fact it starts at 783, which is why we can use those sprites.

One byte is used to define the foreground and background colour of each character set. VDP RAM location 783 is where the cursor and edge character colours are defined. We can therefore change the cursor colour by POKEVing here.

Turn each colour value into a 4-bit binary number, after subtracting 1 from the usual value, eg:

BLACK = normal code 2 = BINARY of 1 which is \$01

WHITE = normal code 16 = BINARY of 15 which is \$0F

To define the cursor as black on white, we place the black binary number before the white binary number: \$1F. Now this 8-bit binary number is converted to decimal: \$1F = digital 31.

So: CALL POKEV (783,31) will change the cursor colour.

TI says the Character Tables run from VDP RAM 1024 to 1535. As each

character occupies eight bytes, this covers only characters 32 to 96.

What of the rest?

It seems the smaller characters are normally derived from the large ones by the removal of two bytes of information, thus allowing an extra set of characters with no loss of memory. However, when it is necessary to define the small characters and ASCII codes above them, the definitions are placed above VDP RAM 1536. Then follows value stack, string space, symbol tables, line index and finally your program.

The cursor is also defined in VDP in RAM in eight bytes from 1008, while the edge character (31) is from 1016. The normal character definition is in 16 hexadecimal characters.

VDP stores the definition as the digital equivalent of eight binary numbers. Each row of pixels is defined in one byte. In an 8-digit binary number, each number has a specific digital value:

128 . . 64 . . 32 . . 16 . . 8 . . 4 . . 2 . . 1

Each on pixel in the line is summed with the others, giving a full line total of 255 if all the dots are on.

If the left-most pixel only is on, the value placed in VDP RAM is 128, and so on. Thus a box cursor can be defined as:

```
CALL POKEV (1008,255,129,129,129,
129,129,129,255)
```

To revert to normal cursor and definition, use QUIT or switch off. Or redefine!

As you can see, the Mini Memory Module can be used to make your TI Basic programs much more interesting.



In the first of three parts, John Noad puts you on the trail of creating your own adventure.

Micro in wonderland

The time can be past, present or future, and the place can be anywhere from Ancient Rome to a far distant planet a thousand years from now.

One of the greatest advantages that Adventure games bestow upon their players is the gift of freedom. The freedom to be anyone you want to be, at any time in history, in any place between here and the edge of the universe. The only limits to a computer adventure game are those set by the ingenuity of the writer/programmer. So, if you've ever thought of creating your own adventure but weren't quite sure where to start, *PCN* can help.

In the next few weeks we'll be looking at some of the most important features involved in creating any adventure. So let's get down to business.

The plot

Just like any other story, an adventure has to have a plot. It has to have a beginning, set out by the writer, a middle, which depends equally upon the writer and the choices made by the player, and an end, where the player receives a just reward for having avoided all the traps and solved all the problems set by the writer.

Sounds complicated? Well please don't be put off. If professional writers are to be believed they often start out with only a few rough ideas about where their story will start and where it'll end. The rest gets made up as they go along.

All you really need to begin with is a starting point, a rough description of the setting and purpose of the adventure, and some idea of how it ought to finish.

The map

Once you have a basic idea of what your adventure is to be about the next important step is to make a map of the area within which the adventure will take place. But before you start to draw the map there are a few things you'll need to take into account:

■ **Storage space.** If an entire adventure program (in Basic) with 100 rooms, a description for each room of 220 characters (average), and an array of movement codes, is loaded into a computer it will take up approximately 40K of RAM. Anyone using cassette storage and a 48K system should take this as a rough guide to the maximum size of their maps *ie* 100 locations/rooms.

However, if you are using a disk storage system then you can aim considerably higher. Although it will mean a pause of about five seconds for each move, a disk referencing adventure may contain as many as 1,000 rooms for each 100K of disk storage available. To get the maximum use from your disks put the master program on one disk and the room descriptions and movement codes on another.



Kieren Phelps

■ Will the adventure be linear or multi-choice? Roughly speaking the difference between these two alternatives is this. A linear adventure has only one correct route to the final goal and only one correct solution to each problem. Thus the map can be quite small with only a few detours and dead ends included because the main point is to solve the problems.

In a multi-choice game the complexity of the map is often as important as the problem solving. There may be more than one solution to each problem — you could kill a dragon with a sword, found in one room, a gun, found in another room, or simply drop a banana skin for it to slip up on while you escape. So, generally speaking, linear games can be based on quite small maps, while in a multi-choice game the bigger the map the better.

■ Will it be a text adventure or text and graphics? The problems involved in writing a text and graphics adventure, as against text only, are twofold. In the first place the graphics should positively add to the player's enjoyment of the game so they need to be of a fairly high standard. Secondly, and most important in this context, the graphics screens on many micros are part of the user RAM. So using graphics may well mean losing storage

space. In the case of disk referencing games this only means that the master program may be affected. And not many game programs need that big a chunk of RAM anyway. For a cassette-based game the use of graphics may drastically reduce the size of map you can use, unless you can compensate by writing the program in machine code.

With these three thoughts in mind we can actually begin to lay out a map. For this you'll need several sheets of paper, a pencil, eraser and at least two or three felt tip pens in different colours. For simple maps the paper can be divided up into fairly large squares, to hold a room number and name. This allows movement North, South, East, West, Up or Down. For more complicated maps the paper should be divided up into octagons (see illustration), to allow movement North, Northeast, East, Southeast, etc.

Since it's very unlikely that you'll be able to draw up a map to your complete satisfaction at the first try don't worry too much about where to put the starting location. The centre of the page is as good a position as any. Now number and label that location. Start numbering from 1, *not* from 0 — you'll see why when we get to the movement codes.

From now on the direction that you plot for each move will depend on what is happening in the adventure. Take another look at the illustration. You'll see that I've numbered a whole block of locations (the squares don't count as rooms). This allows for a range of different movements.

Let's suppose that a large obstacle is occupying rooms 5, 8, 9 and 12. In this case I would leave that area un-numbered and the only legal movement away from the start would be 2, 4, 7, 11, etc. or 3, 6, 10, 13.

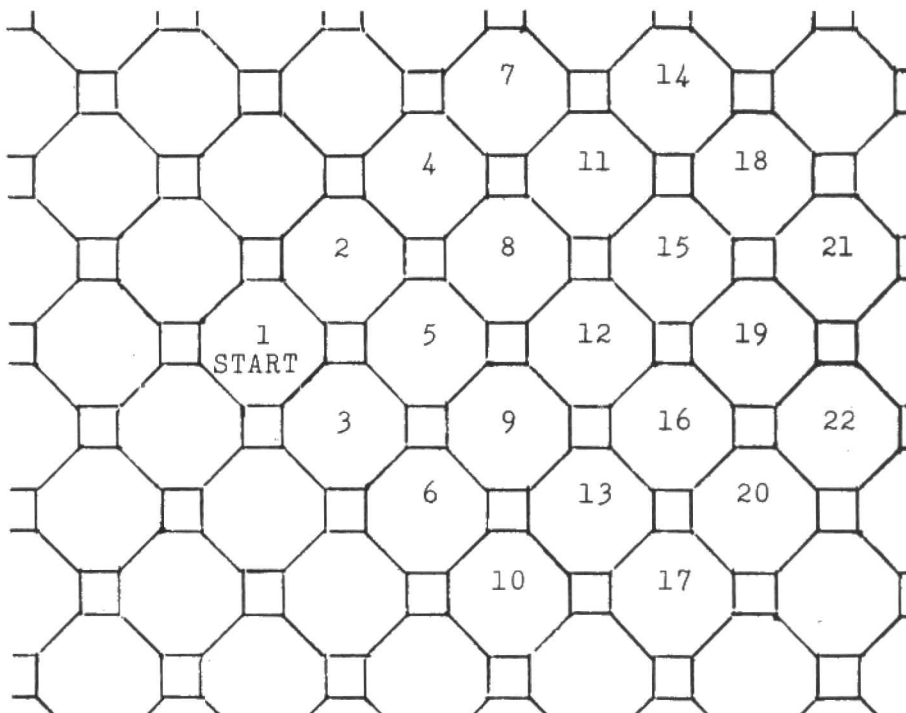
In another situation I might want to use that same area as a swamp or a minefield. In that case all the rooms would be numbered but the player would be sucked down or blown up if he entered rooms 8 and 9, say.

Alternatively, if room 1 was situated in a forest or cave then legal moves might follow a series of twists and turns — 1, 2, 5, 8, 11, 15, etc. While if I were on a city street or travelling in outer space most moves would follow a straight line — 1, 5, 12, 19... It's your game. As long as you give the player a fair chance you can lay out rooms and paths however you like.

Creating characters

One of the great unsettled questions discussed among computer adventurers is: Should a player's fantasy character be dictated by the player, or by the computer?

In practical terms this means the difference between giving the player a number of character points to distribute as



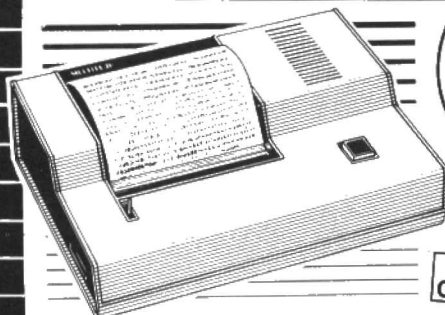
he wishes within a fixed minimum and maximum, or having the computer do the same job — usually in a fairly arbitrary manner with the aid of a random number generator.

Next week there'll be more about maps and characters, plus a description of how to plan movements and set up movement codes.

A starship lost in space, an ancient dungeon, a dense forest — wherever you place your adventure it all starts with a map. Having chosen your starting point, lay down the trail for the adventurer, setting traps and discoveries as you go. You can either use lined grid paper, or draw up octagonal grids for more complicated scenarios.

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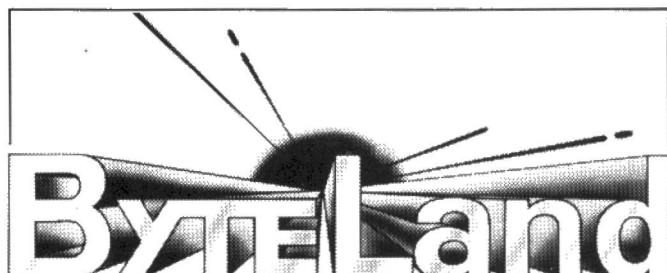
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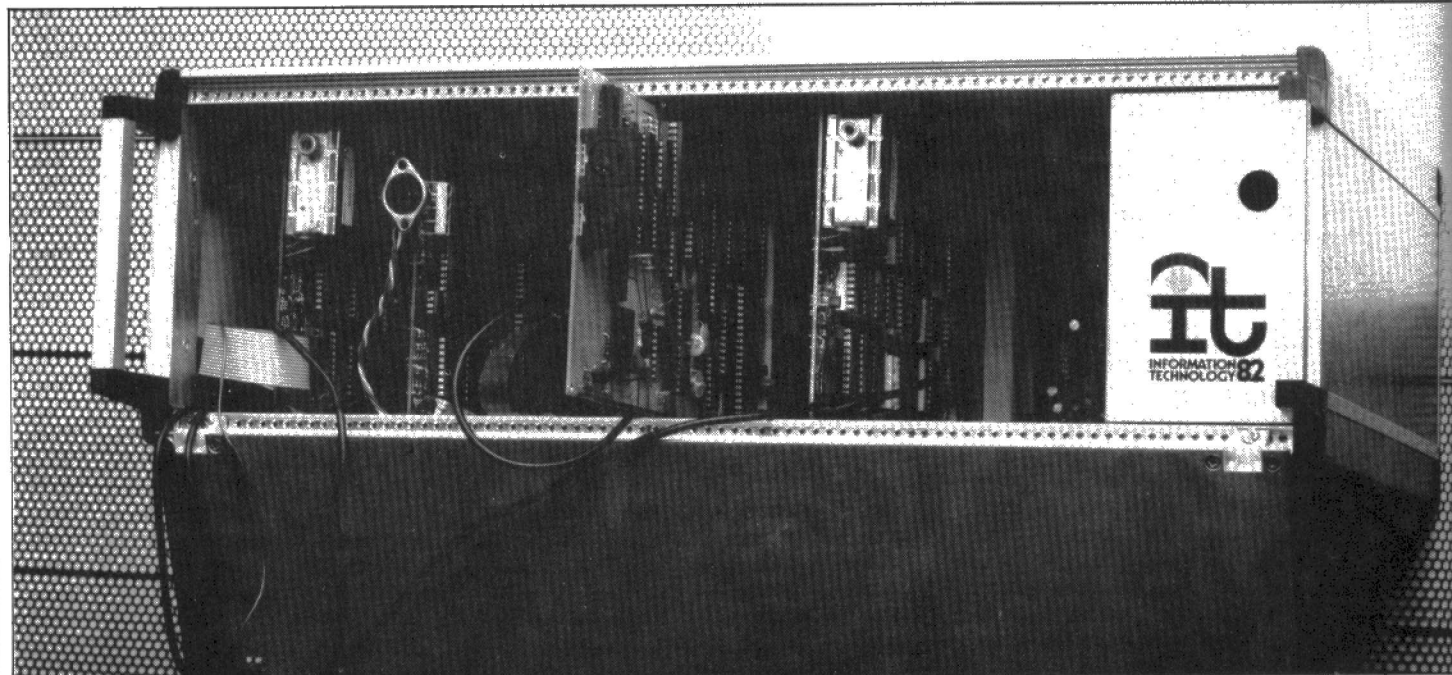
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G E Chkiantz takes a new look at the Microtan 65 — a DIY micro that narrowly escaped extinction

Back from the brink



Open the case: the heart of the system is a 12-slot motherboard with a 64-way Eurocard connector. You add the cards you need.

In the beginning (circa 1981) the Microtan 65 computer system was brought to fruition by Tangerine Computers as a single-board, 6502-based kit. Its main attraction was the facility to build it up to a complete computer system.

About 10,000 systems were sold, despite little exposure, when Tangerine decided to disinherit its child. However, Tangerine dealers Microtan Computer Systems acquired all rights to the system and is now relaunching the machine.

Presentation

The Microtan 65 is principally popular in kit form (see page 30), allowing you to expand in the manner that best suits your requirements and your bank balance.

Any of the boards can be supplied ready-built and some, like the disk controller, can only be bought this way because of their complexity.

The whole system is housed in a smart 19in frame with a very neat switched power supply. A high-quality ASCII keyboard with numeric keypad is also available.

Documentation

There are separate manuals for all the individual components in the system. All are of good quality. The documentation for the main board is typical: it includes adequate constructional notes and does not attempt to hide information.

Because the board may be used in stand-alone form for machine coding, details of the 6502 opcodes are thoughtfully provided, as well as a few games listings.

Most notably, a complete annotated listing of the monitor ROM is also provided with details of how to use the

more useful subroutines, including the registers and locations that are used or that may become corrupted.

Documentation for the Microtan's Basic is average but does have very useful extra sections detailing the use of logical operators, space and time optimisation of programs, the USR(X) functions and a list of formulae to derive mathematical functions not intrinsic to Basic.

Keyboard

Two options are available for use with the system: a keypad and a full ASCII keyboard. Both plug into the same socket on the Microtan 65 board and can be used in the most minimal to the most complex systems as the system firmware configures itself automatically to the device in use.

The keyboard is a 73-key, full travel, typewriter pitch type with separate caps and shift lock. The latter features a warning LED and acts exactly as does its counterpart on a typewriter while the caps lock forces letters only into upper case.

This is well thought out and provides options which should suit most users. Auto-repeat is unfortunately omitted, although there is a repeat key.

The keyboard may be housed in a heavy black metal case which is certainly strong if rather stark and angular-looking.

Display

A variety of options exist for video output of which the most primitive is a 32 column by 16 row, upper case only display of outstanding stability. This circuitry is contained on the Microtan 65 board. Further choices on the main board include lower case and a limited graphics facility

giving a resolution of 64×64 .

In an expanded system further options include a 64×25 colour board with teletext-style characters, lower case, block graphics and inverse or flashing output. This board has both monochrome and RGB outputs but there is an optional PAL encoder and UHF modulator to produce composite video.

For high resolution graphics, a monochrome board originally made by Tangerine is on offer and a colour board is also available. Both offer a resolution of 256×256 . Neither was supplied on the review machine but extra software is available to drive them.

Microtan says an 80-column board is under consideration and a final bonus to graphics programmers is the ability to mix text and colour high resolution graphics on screen.

The system

The Microtan 65 is basically a 12-slot motherboard with a 64-way Eurocard connector carrying the bus information. Three of the slots are dedicated to particular boards, namely the Microtan 65 board, the Tanex 7K RAM card, and the TANDOS disk controller board.

These slots are all clearly marked and have the connectors offset to avoid errors. A smaller two-slot expansion board is also available to house the Microtan and Tanex to form a discretely powerful package.

The complete system bus has extensive paging facilities controlled by software switches which are sensibly located in the system ROM area and allow up to 256K of memory to be accessed at the flick of a switch.



The Microtan 65 board itself houses the 6502, 1K of RAM, 1K of ROM, the keyboard interface and the video circuits. The Tanex board is its closest companion, providing full address decoding and data bus buffering that could not be fitted on the Microtan.

The memory map of the system is allocated by this board as 47K of RAM, 1K

of I/O, and reserved areas for languages in ROM and system firmware.

It also provides a considerable extension to the system as the board can hold up to 7K of extra RAM, 14K of EPROM, and two 6522 Versatile Interface Adaptors giving 32 I/O lines. Some of the I/O lines are used to provide the cassette and RS232 interfaces, others provide a Centronics printer

port but they may also be used for other purposes.

Expansion

The TANRAM board forms the main memory expansion for the system with 7K of static RAM and 32K of dynamic RAM using 4116 chips. This boosts the system to its full complement of 47K of RAM. The

30 ►

427 use of dynamic RAM keeps the chip count and power requirement to a minimum but limits the top speed to 1MHz.

An EPROM switching board is a useful addition, especially for those using cassette-based mass storage. The ROM area is decoded into two 4K and two 2K blocks which means the 10K Basic, 8K Forth, 8K word processor and two pass assembler plus several toolkits are instantly accessible.

An EPROM programmer allows you to program all common 2K and 4K devices. The EPROM is powered only during command operations so removal is safe. Software is provided to check, copy from EPROM to memory, program either the whole device or single step, and verify.

Basic

A 10K Microsoft Basic is available for the machine with all the usual features. It lacks the advanced commands now becoming increasingly common but does feature full error messages.

A screen-orientated editor is provided which is set up for the original 32-column screen. If the 64 x 32 card is in use a copy of the original screen is placed in the centre of the new one. Dotted lines highlight the line to be edited and a nice feature is that, depending on which terminator is used on the line, either the next or the previous line may be brought into the edit buffer.

For the machine code programmer, the Microtan comes with a built-in monitor. It is very neat and competent and features the usual facilities with some extras. You can single and multiple step through a program, and set up to eight breakpoints.

It can be further augmented by XBUG which includes a disassembler and single line assembler plus extended printer support and some useful memory management routines.

Additional high level languages are available including Pilot, an implementation of FIG-Forth and a full-blown two-pass assembler. All can reside in EPROM, leaving the RAM area free for programs.

Verdict

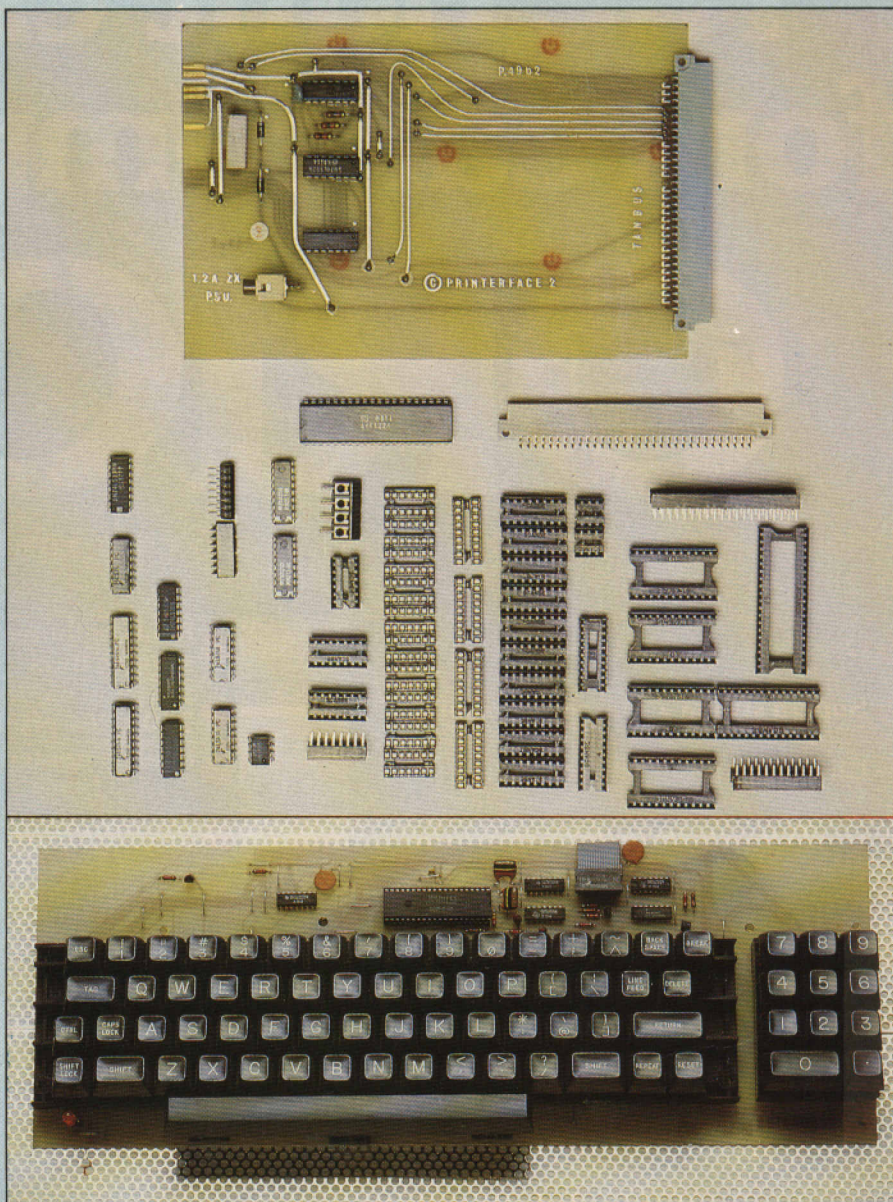
The Microtan system will appeal to enthusiasts who do not want a little box full of mysteries, but would like to get intimately acquainted with their machine.

The 65 is capable of expansion in almost endless variations.

There are some problems: the 65's processor clock speed of 0.75MHz scarcely does justice to the 6502 which may now be driven up to four times as fast. I also feel that the price is rather high.

When comparing the system with others available you should remember that it is not a rival to the Oric and Sinclair machines. It is aimed more at the BBC and Apple markets with the advantage that it is extremely flexible, leaves you with more RAM than the BBC and you do not have to buy everything at once.

The system is a taut and intelligent design. With the quality of documentation and backup, it is easy to understand users' almost fanatical loyalty to the machine.



Soldering on . . .

Microtan in the making — David Guest is the only man for the job.

There's nothing quite like a distinctive aroma for bringing out the poet in people. With some it's damp leaves or freshly-mown grass, with others home-cooking or a subtle perfume.

With veterans of the computer business it's solder. As Martin Duvall might have said in *Apocalypse Now*, there's nothing like the smell of solder at breakfast. (In fact he was talking about napalm but solder can have a similar if less dramatic effect on a carelessly positioned African violet.)

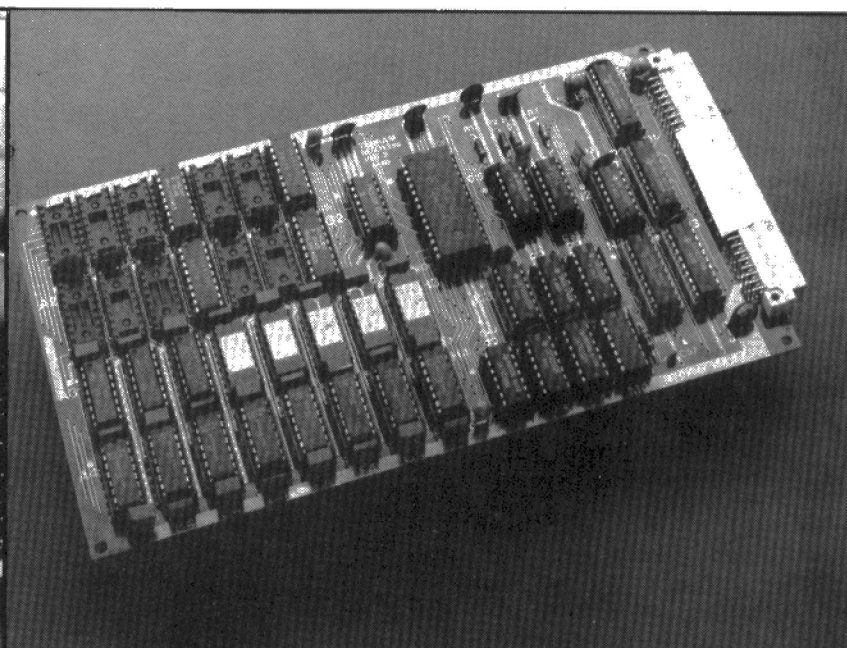
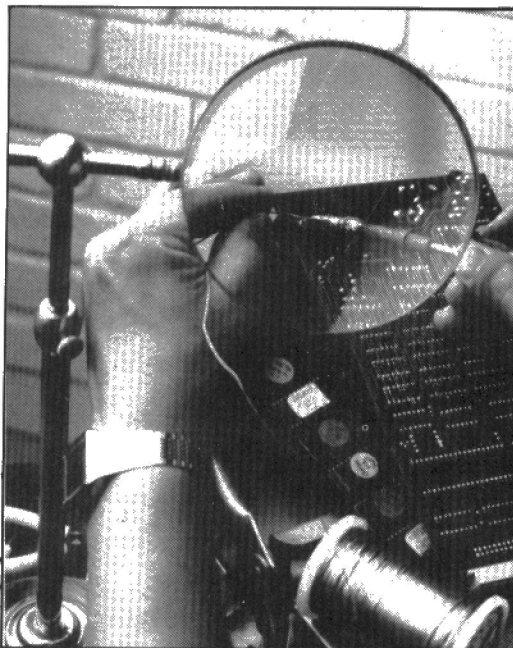
Micros that require you to take up a soldering iron are few and far between these days, so Microtan might find itself fuelling a nostalgia boom with its Microtan kit.

A new generation of enthusiasts could discover the delights of microcomputer construction, and old-timers could treat themselves to a sentimental journey, the more so since the Microtan 65 is none other

than the old Tangerine micro under new ownership.

I, from the PCN team of experts, was hand-picked to build this device because I'd never wielded a soldering iron in my life. I should therefore declare a prejudice — I'd never touched a soldering iron because I'd never wanted to. I'd long suspected that ready-made systems were unreservedly a great boon to mankind and that soldering had not merely gone out of fashion, it had been superseded as a tedious and unreliable operation.

Any such newcomer to the technique requires guidance, and Microtan's documentation helpfully suggests that you read the manual before attempting anything. The manual covers almost everything from the rudiments of binary arithmetic to the intricacies of the discouragingly named Tanbug operating system. Its punctuation is idiosyncratic, with commas flung across



First expansion: the TANRAM board offers 40K RAM with both static and dynamic chips.

130

the pages, and the writer's sense of prepositions betrays an Iberian origin, but by and large it doesn't read badly.

It is in the Aids to Construction that the manual falls down and this, of course, is where you need it most. The components are listed and the PCB is clearly marked, but not all the devices supplied correspond to those listed (is a 21L14 chip functionally the same as a 2114?), nor do the marks on the board tell the whole story.

When you've washed your hands, earthed a piece of aluminium foil and prepared your artificial aids, you should be confident enough to begin. Almost immediately you'll find a problem — the first items to solder to the board are the sockets in which the chips will sit, and you have to put them in the right way round.

The manual advises you to make sure that the Pin 1 identifier is at the appropriate end, but the sockets lack a Pin 1 identifier. This isn't an insuperable problem — you can just get stuck in, be consistent, and hope you guessed right. But doubt will grow in your mind and by the time you have to check the polarity of the diodes (again without help from the manual) you may have begun to wonder whether you weren't presumptuous in breaching the sacred inner sanctum of technology. It isn't difficult to retrieve an occasional soldering mistake but if you get the whole board wrong you can't unravel it like a badly knitted woolly.

At least the act of soldering holds no mysteries. Try to sit with a draught taking the air away from you or the famous smell will grip your nose and the smoke will bring tears to your eyes. And something mindlessly rhythmical in the background can be a help — tennis on the TV, perhaps, or a Uriah Heep LP. All you need is a steady hand and an appreciation of the joy of dull, repetitive manual labour.

After the sockets you move on to the resistors, colour-coded and as pretty as a child's jewellery. Here you'll need wire-cutters, and don't throw the pieces of wire away — you need three of them for links

later (the manual says four but if you can find LKNM1 on the board please write to Microtan asking them to print it on all of them.)

After the resistors the capacitors, and after them the diodes of doubtful polarity. By now the end is in sight and these fiddly bits are like a rest cure after the 14, 16, 20 or more pins of each socket. The transistors and the crystal lead you to the final items — the UHF modulator and the edge-connector. This last unit has upwards of 60 pins, and after that you've earned a rest.

All that remains is to fit the chips into the sockets — the right way round, and of course the right sockets. The mystery of the Pin 1 identifier re-surfaces. What can you do except fit the chips all the same way round and hope for the best?

The chips, incidentally, are like a geography of the world's sweat shops. They come from El Salvador, Indonesia, Singapore, the Philippines, Malaysia, almost everywhere in the free world where freedom means the opportunity to work for American multinationals at pitiful wage rates.

At the end of the manufacturing process, when you sheathe your soldering iron and apply a dab of Vaseline to the last burn, it's time to take stock. In the literal sense this means checking that there are no bits and pieces lying around that should have been welded to vital parts, but the

'All you need is a steady hand and an appreciation of the joy of dull, repetitive labour'

metaphorical sense is more restful — it involves sitting back and drinking in the satisfaction of a job well done.

There is one drawback. Until you acquire a keyboard, a power supply, a monitor, associated leads, and a 13amp plug, you have no way of knowing exactly how well the job has been done. Don't let that put you off. A job should have a beginning, a tea break, and an end. When you've applied solder to so many points that the damage is irrevocable you can regard the job as finished. Let the quality control experts worry about the quality.

PRICES

Microtan board	£59.95
Tanex expansion board	£49.95
40K memory board	£79.95
Keyboard	£79.95
TANDOS	£99.00
Colour VDU board	£89.95

SPECIFICATION (basic system)

Price	£59.95
Processor	6502, 1MHz
RAM memory	2K expandable to 48K
ROM memory	2K expandable
Text format	32 × 16 b/w
Graphics screen	64 × 64 b/w (colour and hi-res options)
Keyboard	optional
Storage	cassette, 300 baud
OS/language	Basic
Distributor	Microtan Computer Systems, Dulwich. Tel: 01-693 1137
Software included	None

Acornsoft's BCPL is one of the pieces of advanced software which has so long been promised for the BBC. It's a systems language, meaning that it's intended to be used for writing the more fundamental kind of software, such as editors, compilers, DOS programs, and even languages. It isn't really intended for learning to program.

Users ought to be fairly conversant with machine-code — but it isn't absolutely essential, but you should have a solid understanding of compilers, linkers and other such.

The actual language was first designed some fourteen years ago by Dr Martin Richards at Cambridge University, and is not totally unlike B, which is also a precursor of C, in which the Unix operating system is written.

The version tested is meant to run on a BBC Model B, though it will run in a limited fashion on a Model A, consists of a ROM chip, which plugs into one of the 'sideways ROM' sockets on the BBC, and a 5¼in disk. BCPL is a complete systems-development environment, with an improved OS, two very sophisticated editors, a compiler, assembler and linker, as well as a library and support routines.

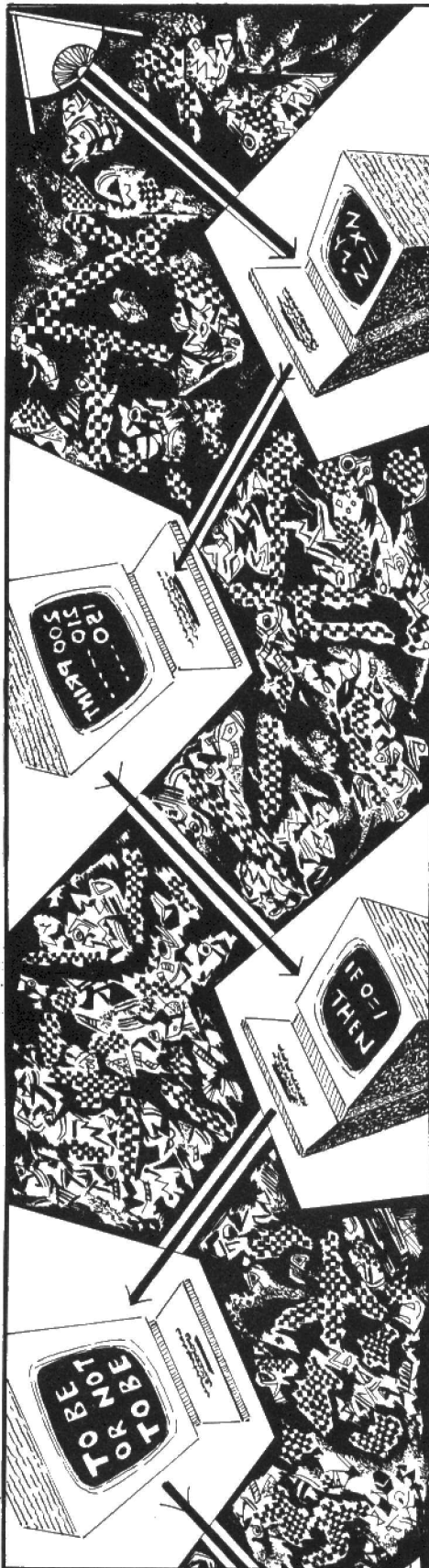
It includes a selection of programs with which a textfile can be written, stored, compiled, linked, run, tested and debugged.

The first program which will be run after the system is booted will probably be one of the editors, ED or TED (Tiny ED). The former is quite something.

With this feature, it is possible to perform such complex operations as converting a program-file from one dialect to another, or even to another language. Naturally, if you get one of these wrong, the result is that your program looks like it got hit by a train! In this case there is no chance to recover, so the only hope is to make a backup after every successful operation.

Once the textfile is complete, it is submitted to the compiler, which outputs a tokenised version of the final program. This will eventually be in Cintcode (Compact Interpreted Code), which is a 'pseudo-code' for a 'pseudo-machine'.

The tokenised hex is loaded, relocated to the desired place in memory, then the relocated hex is linked into the system. Saving it will produce a binary image which can be run as a normal machine-code



program, even though it is in fact interpreted, and part of the linking process is to connect the interpreter with the code. The result is a compact and reasonably fast program, which to all intents and purposes can be considered a stand-alone program.

It is also possible to include copies of suitable routines in the final code, thus making it truly stand-alone, but naturally, it will also be bigger, due to the extra routines. This puts a top-limit on just how big a program you can write. In fact, there's also a limit on how many lines can be compiled at one go. The book says that it's about 200 lines of source-code on average.

The combination of these two limitations means that it will not be easy to develop very large programs without considerable care, though this will be possible, since BCPL has the ability to handle overlays and co-routines.

One thing BCPL doesn't have is the ability to generate 6502 machine-code from the compiler. The authors say that this is because the 6502 is a pig of a machine to write compilers on. Be that as it may, far too many entries in the BCPL procedure library are labelled as being 'specific to this implementation'.

The system comes in a kind of library-case which holds the book and the ROM-chip. The documentation to the system is a very fat book, called *BCPL for the BBC Microcomputer* by Chris Jobson and John Richards. The system is rather better documented than any such programs; it certainly can't hurt for the implementer and the documentor to have a very close understanding of the intentions of the originator.

It launches into the main topic, what is BCPL and how it is used, almost on the first page, and the answers assume a fair degree of knowledge. They don't bother to explain binary, Hex or anything else at that level. This is just as it should be. It is quite clearly intended for experienced users, and they are not going to tolerate a lot of stuff they know already, especially if it gets in the way.

My main complaint about the documentation was the binding. I found the things so fat that it wouldn't stay open on the page, and I'd have preferred the ring-binding which was used on the BBC machine user-guide.

Getting the system up and running is a

matter of finding the installation section, neatly buried as chapter 9, and putting the ROM (carefully) in one of the sideways sockets at the front left edge of the board. If the ROM is installed at the leftmost socket, it will be used as the 'boot system', otherwise it must be called up with a *BCPL system-command, which will respond with a ! prompt.

It is now in the command state, and most of the *-type calls work as normal. There is also an extended command-handler, which has several useful utility-commands, and unlike in Basic, it is not necessary to specify a RUN "program" . . . just typing in the name of the program will run it by implication, rather like CP/M, so any program-files on the disk become effectively built-in.

But the system is considerably more advanced than CP/M. In particular, there is the concept of there being more than one valid program in the machine at one time. This is true of CP/M, and most other operating-systems, but in the BBC BCPL system the program running in the command-state is suspended when the run-state program is executing.

The interesting detail is that the user (run-state) program and command-state programs can swap between each other, so effectively multi-tasking. The same mechanism is used to co-process several jobs at once, and the system is able to handle the re-entrance problems which go with this technique, so the programmer generally needn't concern himself too much about the mechanics.

There's a bit of a shortage of backup — apart from the manual, I could only find *BCPL — The Language and its Compiler* by Martin Richards & Colin Whitby-Stevens, published by Cambridge University Press, on the subject.

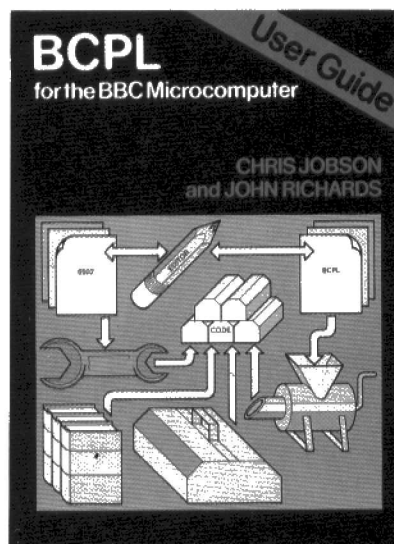
Performance

In action, BCPL is good, or could be in the hands of a good programmer with time and ideas. All that can reasonably be done through calls to the MOS is well documented, as is much of the internal workings of the interpreter.

It isn't really possible to comment too deeply on a language/OS combination without spending plenty of time on it, because such snags, quirks, bugs, and oddities as are bound to lurk in wait don't leap out at first. If they did, the system would be unuseable.

I was very impressed by the de-bugging facilities. It has the ability to report what's happening with the names used, instead of the addresses, as well as to count how many times a procedure is used. I'd like this in my own system. Unfortunately, though it's terribly clever, it is a bit of a luxury, and gives a clue as to the thinking surrounding the BBC, which goes off on clever tangents without checking that the groundwork is solid.

As with most operating systems, there isn't much in the way of a user-interface. In BCPL it's an '!' prompt and a command-interpretor which replies with rude messages when you get things wrong.



The most important detail is the Escape key, which causes a program-interrupt, suspending the current program and returning to the previous state, which will generally be the command-state. If it's pressed while a line is being input, then it acts as a CANCEL, ignoring any characters already entered.

Flexibility

Flexibility comes in two flavours with things like BCPL. On the one hand it is an operating system, and on the other it's a language.

The BCPL operating system is magnificent. In fact, it's effectively a whole new machine, and apart from the limitation of 31 files per disk, which comes courtesy of a pitiful excuse for a DOS, the DFS, it's a great improvement.

There are several new commands, two editors, and a whole bunch of utilities. The complete system is as good as any other available on the smaller micros like the BBC, Apple and so on, and considerably better than some, even on bigger machines.

Of course, this power is not always easy to call up and control, and on any other system I'd suggest a set of carefully written EXEC files, so that big, complex jobs could be run in batch-mode.

With BCPL as it stands the complex syntax, which isn't particularly uniform, has to be typed in a lot, try:

```
BCPL/F source/S.object MAX REPORT
= /L
```

```
JOINCIN/F.b.piece/S.object AS/F.pro-
gram
```

This will take 'source' from the current filing system, compile it and put the object-code into the STORE, won't read in routines from the library until needed, so memory isn't used up too fast, put out a compilation-listing on the printer, then link 'b.piece' from the current system and the bit just put into the STORE, and write 'program' onto the current system.

As a language, it isn't quite as good, especially if you believe the claims made about portability. Provided you stay on the BBC it'll be OK, but don't get too many big ideas.

This is because there's much too much of the supporting structure labelled as being implementation-dependent. There just isn't any excuse for saying that START, which actually starts a program running by calling the interpreter, is liable to pick up its parameters in an unpredictable way.

Reliability

The system is pretty tough, as it should be, but there's a couple of real horrors. Would you believe that *BACKUP, *COMPACT and *COPY (all DFS calls) actually overwrite the heap, causing a total and irrecoverable system-crash?

The only way out is to hit Break. These calls are almost certain to be needed in a system program, and to let a fault like this through, thus forcing the programmer to invent them for himself, is quite unforgivable.

Verdict

As a language, BCPL is acceptable, particularly for its intended use. It has pros and cons, but overall, I'd not rate it as highly as a good C, which it resembles quite closely.

This is for two main reasons. First, it doesn't offer the programmer as uniform and consistent an interface on a range of machines as C does. The large number of routines which cannot be relied upon to be present means that even if you don't want to, you'll wind up doing a lot of systems work in it, just to make sure that the code is there to do the jobs you will inevitably need to do.

My second reason is the muddled thinking that seems to underly parts of the system. The book says that BCPL is an 'untyped' language, and that all data is held as 'cells' of two bytes, which may thus be used as integers, pointers or anything else which will fit into sixteen bits, and that the programmer is responsible for making sure that he's doing what he wants with it, and that it's in the right range.

This approach has many merits, but the integer-only arithmetic can get a bit cumbersome. Granted, long-integers, reals and so on are not often needed in systems, but somebody must feel they're necessary, since there is a set of floating point routines in the library on the disk.

However, there is no implementation of C on the BBC, and BCPL is an adequate systems-programming system.

Certainly, it's as good as similar products, such as the UCSD p-System. Whitesmith's C, Aztec C, APEX/XPLO and the like, several of which are much more expensive.

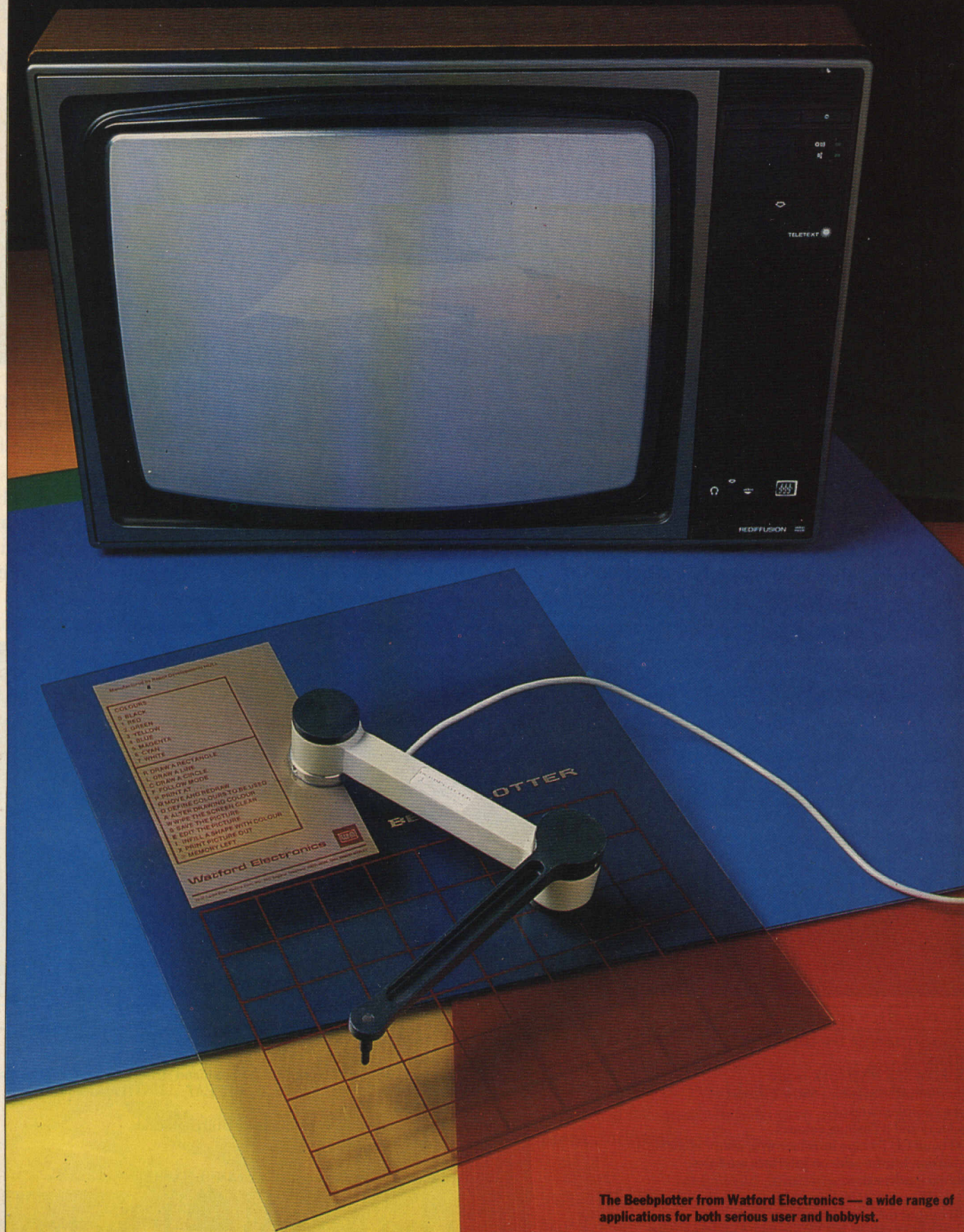
RATING

Features	4
Documentation	4
Performance	3
Usability	4
Reliability	3
Overall value	4

Name BCPL System BBC Model B with disk-drive Application Systems language and environment Price £99.95 Supplier Acornsoft

David Summerfield and Richard Blue trace the pictorial potential of the Beebplotter.

The Beeb shapes up



The Beebplotter from Watford Electronics — a wide range of applications for both serious user and hobbyist.

The BBC micro has attracted a significant number of peripheral devices, courtesy of various independent manufacturers, as the micro makes inroads into the apparently booming education market. This is a welcome development for the educators (and Acorn) but it also increases possibilities for the non-institutional BBC owner.

The Beeplotter is a recently-developed tracing device for the BBC very much along the lines of the RD Digital Tracer (reviewed in *PCN* issue 24). With it you can trace the outlines of shapes from paper (or straight from your imagination) on the screen and then save them to disk or tape and/or output them to a printer.

The device represents a big improvement over the cumbersome MOVE, PLOT and DRAW commands which BBC users are otherwise constrained to use if they want to do some drawing on the screen. The other alternative is to purchase a simple draw-with-joystick program — but this technique lacks the tracer's precision and flexibility.

Design

The Beeplotter is designed for use in schools and is suitably tough. It has a large perspex base onto which is fitted an arm with a stylus at one end. This can be moved around an A4-size sketch pad area. The arm has two variable resistors as joints. When it is plugged into the BBC's analog port, the values of the resistors are read in and the position of the stylus calculated.

This gives a direct relationship between the position of the stylus and that of the cross-hair cursor on the screen. Drawing is then a matter of moving the stylus over the base board rather than guiding a cursor around the screen with the arrow keys on the keyboard or with a joystick. This makes the Beeplotter ideal for copying pictures, maps or diagrams into the computer by tracing round their outlines with the stylus. The clear base means you can put the Beeplotter over any book too thick to fit between the stylus and the base board.

The Beeplotter comes in a stiff brown cardboard box that looks as though it would stand up to the worst efforts of the Post Office. It is supplied complete with a lead to plug into the analog port of a 32K BBC, a cassette of software, clear manual, dot-to-dot picture of a steam train that lets you practice using the system and a demonstration program which draws a map of England and Wales.

In use

The Beeplotter can be used in any of the BBC's five graphics modes (0,1,2,4,5) although flashing colours are not available. The choice of mode, as usual, is a compromise between resolution, amount of memory left for the data and number of colours available.

The software supports several commands although notably not 'delete last point'. There is a quick reference list of these printed on base board. Unfortunately the commands must be selected from the

keyboard rather than by pointing to them on the base board with the stylus. That means you have to keep glancing at the keyboard to find the right letter for the next command you want to use.

To draw rectangles, lines or circles the cursor is moved to the corner, end or centre respectively. Then as the cursor is moved around the screen a flashing shape follows it and can be fixed by pressing the space bar.

Alternatively the 'follow mode' can be used. This lets you trace out irregular shapes, as movements of the stylus are directly converted into lines on the screen.

However, the lines on the screen can be even more irregular than the shape you are trying to trace. One of the variable resistors on the Beeplotter we tested was stiffer to move than the other, making it difficult to draw smooth lines.

Text may be included in diagrams, although if you later redraw the picture in a different mode the relative size of the letters changes. Enclosed shapes can be filled with colour quickly using the INFILL command. However, if the shape is too complex, the program sometimes can't cope and crashes.

Pictures can be saved quickly to tape or disk, as the series of commands entered is stored rather than the whole of the screen memory.

Routines are included on the program tape which allow you to incorporate pictures drawn on the Beeplotter in your own programs. Finding the start of a data file on tape is made unnecessarily difficult as the program 'hides' the information the BBC normally displays when loading from tape.

As the pictures are saved in data files a bug in the old (0.1) BBC operating system will often cause data to be lost. When disks are used the DFS workspace must be overwritten if modes 0, 1 or 2 (20K high resolution modes) are to be used. This means high resolution pictures cannot be saved to disk.

However, the program lets you move data easily from tape to disk. The amount of free memory can be displayed at any time by pressing the '@' key, and when running the program there seemed to be enough memory available for most pictures.

The software allows you, without clear-

ing the screen, to clear the area of memory in which the command sequence used to draw a picture is stored. This lets you load in a second set of data to overlay the first picture, which means that if a picture you are trying to draw will not all fit into memory at once, it can be split up into separate sections.

The demonstration program supplied uses this feature to first draw a map of England and Wales and then to superimpose the rivers.

Unfortunately the only way to edit pictures involves going through every command entered so far and telling the program if it is right or not. This is particularly annoying as each section done in follow mode counts as one command.

Commands are supposedly provided to copy sections of a picture from one part of the screen to another. These would save both time and memory space, but we couldn't get them to work.

The manual gives listings of routines in Basic which can be added on to the end of the main program to dump the screen to either a Seikosha or Epson dot matrix printer. The one for the Epson, which we tested, did not work.

Verdict

The Beeplotter has been designed for use in education, not computer aided design, and it is probably tough enough to stand up to use in schools.

The hardware is let down by unpolished software which neither provides a full set of facilities nor is crash-proof (or even crash-resistant).

Applications seem limited as it is difficult to trace smooth lines in follow mode or to get straight lines vertical or horizontal without a step in the middle. But it's excellent for drawing maps of countries with wiggly borders. At £59 plus VAT the system seems to be poor value for money compared with joystick-based programs for less than £20, unless the Beeplotter's particular ability at tracing existing diagrams is required.

Item Beeplotter Price £59 + £3 P&P + VAT
Machine BBC micro with 32K RAM and analog port **Contact** Watford Electronics, 33/35 Cardiff Road, Watford, Herts WD1 8ED, tel (0923) 40588

CHOOSE YOUR GRAPHICS MODE

R — Draws a rectangle L — Draws a line C — Draws a circle D — Defines colours A — Alters drawing colour W — Wipes the screen clear S — Saves the picture E — Edits the picture I — (In)fills a shape with colour X — Prints picture out @ — Prints memory left

	Colours used	Horizontal resolution	Vertical resolution	Memory used
Mode 0	2	640	256	20K
Mode 1	4	320	256	20K
Mode 2	8	160	256	20K
Mode 4	2	320	256	10K
Mode 5	4	160	256	10K

The Beeplotter has different capabilities when used in its five available BBC screen modes. As you can see available colours are traded off against horizontal resolution, or in the case of modes 4 and 5, against memory.

Henry Velleman shows you how to convert your Pet into an 8032 with the help of Microport.

If you are the owner of a small (9 inch) screen CDM/Pet you may well be feeling that technology, and Commodore, are rapidly leaving you behind.

It's three years since the introduction of the 8032, 12 inch screen, 80 column business computer, and the majority of non-games software for the CBM range since that date has been oriented heavily towards this 'upmarket' model. Just in time to save you from upgrading to a 64, Microport has produced a Printed Circuit Board (PCB) which fits inside all but the very early 40 column CBM/Pet's and converts them in all respects, except of course screen size, to an 8032.

Microport has been actively involved in add-ons and repairs for the Commodore range since the late seventies. As supplied, the conversion consists of a main PCB, a smaller PCB which fits onto the outside of the computer with the 40/80 column switch, 5 connecting leads, and a small block of black conductive foam. Don't be hasty and throw the foam block away as mere packaging, it actually performs an essential function in providing a ground path between the screen and the main board which Commodore never envisaged as being necessary.

Detailed instructions are supplied, explaining the steps necessary for installing the conversion, and while no drastic modifications are required to the original circuit board, I think that the majority of owners would be happier to take advantage of Microport's free fitting service.

If you do decide to fit the kit yourself then be advised to read the instructions through carefully several times until you are sure they are clear to you. I emphasise this point as I feel the instruction leaflet sets out to be over helpful with all sorts of technical asides which serve only to stray the mind from the important task at hand.

Switching on

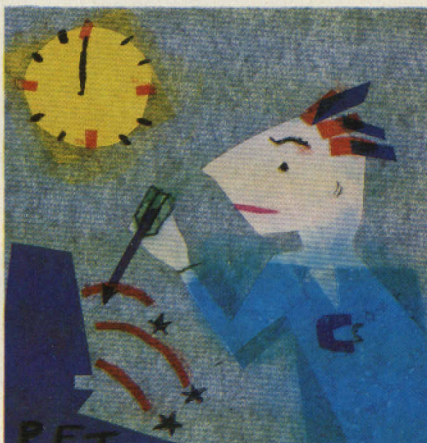
The fitting of the conversion should physically take about half an hour. Switching on the power in 40 column mode gives you exactly the machine you had before you started. Switch off, select 80 column mode with the single switch on the right-hand-side of the case, power-up again and you're into a completely new ball game.

Apart from the obvious fact that the characters are approximately half size they are also styled differently, as Microport supplies a character set based on that in the 64, making text clearer at the reduced size. Although I didn't find it necessary, the instructions state that you may need to re-align the screen to position both the 40 and 80 column display centrally.

The 80 column display has both a standard and an expanded mode in which lines of text are moved further apart. Should this re-alignment be necessary then it must be carried out by a suitably qualified person, as it involves adjusting high voltage parts of the video display.

The keyboard of the 40 column CBM/

Widen your horizons with a bigger Pet



Pet is not the same as the 8032. Microport has got around this by implementing the never-used (by me anyway) shift lock key as a control key. By combining this with other key sequences, eleven additional editing facilities are available. These are adequately described in the instructions. These facilities are a toggle between graphic and text format, scroll screen up or down, set and move to TAB, an escape quotes mode, set top and bottom corners for window facility, and finally delete line to or from cursor. All these features can be used under program control, except escape quotes, and appear in the conventional Commodore reverse field format in PRINT statements.

A BELL is implemented on CB2 sound which chimes on power-up. It is also available to provide simple sound in your



programs. All keys have an automatic repeat if held down. If you don't have sound then Microport sells a 'sounder' for just £4.50.

One of the most useful features is the ability to set screen windows. If you don't know what a screen window is then let me explain. By specifying corner points, any size and shape rectangle can be set on the screen as the only area of the screen that is active. If you then list or run a program it will only appear within the restricted area you have selected and the rest of the screen will remain frozen with the image that was on it at the time the window was set up. Some amazing effects can be created with this facility, especially when combined with the scroll up and scroll down commands.

Options

In addition to the switchable conversion tested, Microport makes a standard 80 column board for £15 less which makes your machine permanently into an 8032. Several options are offered at a small extra cost. These include a dual character set ROM and also an additional 2K of video RAM which allows instantaneous switching between two different screens. If your machine does not already operate on Basic 4.0 then you will need to upgrade at a cost of £49.

Conclusions

The Microport conversion produces an exact software replica of the Commodore 8032 and is able to run any Basic or machine code program written for this machine, including compiled programs. It is even possible to add a 64K RAM board and so upgrade to an 8096.

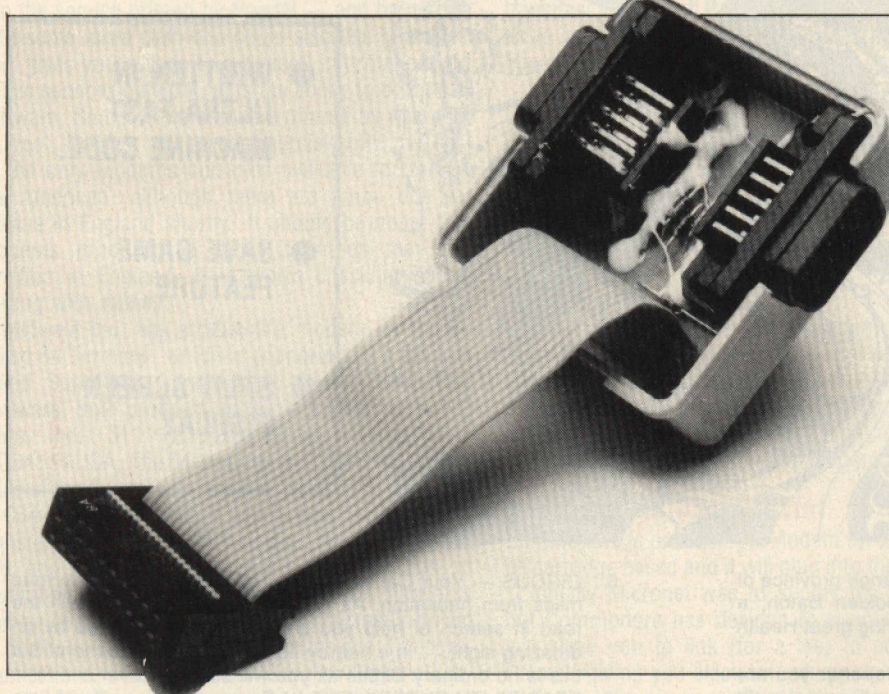
Whilst the 80 column display is on the small size it is more than acceptable and I would rate this product as a very cost effective solution for those CBM/Pet owners needing an upgrade path, particularly with business software in mind.

Finally, if you belong to the Independent Commodore Products User Group (ICPUG) then Microport will give a 15% discount.

Item Microport 80 Column Switchable Conversion **Machine** CBM/Pet 9 inch Dynamic RAM Computers **Manufacturer** Microport Microcomputer Services (01-953 8385) **Price** £164 plus VAT.

Pase has beaten Oric at its own game with a joystick interface for the Oric 1 — David Janda reports

Chocks away for the Oric



The Oric-1 has become known to many as a games machine. It's hard to remember now exactly what the expected market for the Oric was, but my impression at the time was that it was a machine on which computer newcomers were expected to learn Basic programming, much along the lines of the Spectrum.

The Oric, of course, was also expected to accumulate a smattering of peripherals courtesy of Oric Products. Little emerged except the recently released Oric printer (*PCN, Issue 21*).

Arch-rival Sinclair Research meanwhile (no doubt partly prompted by the impressive demand for joystick controllers being met by independent manufacturers) is putting the finishing touches to a second interface for the Spectrum. Sinclair's Interface 2 will involve a pair of joystick controllers.

Joysticks appear to have been underrated by manufacturers in their rush to provide high-resolution colour graphics and sound. It's therefore no surprise to learn that a joystick interface has been released for the Oric 1 by an independent manufacturer.

Pase released its joystick interface at the Earls Court computer fair earlier this year. The joystick interface consists of a small cube about the size of a matchbox which attaches to the Oric's printer port by a short

ribbon cable. There are two 9-pin male sockets for the Atari-type joysticks which are used with the unit. These joysticks seem to have become the standard, and it will be interesting to see which type Sinclair will choose.

The interface is made of plastic, and is very light and unobtrusive — once attached to the back of the Oric you can probably forget it's there.

Because the unit is attached to the printer port, it's not possible to use the printer. You may also come across problems using sound.

Games enthusiasts will no doubt be

interested in this product as several houses have decided to make their games compatible with it — Salamander Software and IJK are two examples. But how universal it will eventually become, especially if Oric decides to come out with a contender, is hard to tell. This is one of those chicken and the egg situations.

Compatible software will equal joystick sales and vice versa. If one doesn't do too well the other gets dragged down with it, leaving the user the loser — no commercial games software.

However, it is possible to make an interface work without pre-prepared software. To achieve this, Pase includes a four page instruction sheet which gives details of how to make a patch to the Oric's system interrupt routines. Two small program loaders are also included.

Using these it is possible to PEEK locations 400 and 401 hex to find the status of the interface. When the joysticks are used, a value is returned to either of the addresses and your program can act accordingly. Details of how to set up the patch and how to interpret the returned values are included within the documentation.

The instructions point out that a possible ten values can be returned to the addresses. They are: NW, N, NE, W, 0, E, SW, S, SE and FIRE.

A free game cassette is included with the package, and this demonstrates the use of the interface. Looking at the listing will give users an idea of how to incorporate joystick routines within their own programs.

Pase is asking £14.95 for the interface, and on top of this there is the added cost of a joystick. A look at the inside of the interface reveals only a few pounds' worth of parts, and I feel it is over-priced, though Pase claims that the production costs are high.

Altogether the interface worked well, and I experienced no trouble with its operation. The only question mark concerns the durability of the flimsy casing.

Item Joystick Interface **Computer** Oric 1 **Price** £14.95 **Manufacturer** Pase, 213-215 Market St, Hyde, Cheshire. Tel 061-366 5935. **Outlets** Various computer shops and mail order



ALL THE EXTRAS YOU NEED FOR A 64 LINK-UP

A modem enables you to communicate with other computers, especially with networks. This is achieved via a telephone link.

Using a modem on the 64 you could at present join the service offered by Prestel — and by parting with some more cash one could also use Micronet. This gives you access to a general information and public services network, plus the ability to download software. Some of the software offered by Micronet is 'free', the rest will be commercial software.

The only Modems currently available for the 64 are American, although there are some due for release in England shortly. It should be noted that modems produced in other countries may not function in England. It is worth checking before parting with money.

Midwest Inc. has produced a modem for the 64 called 64 Terminal, which is supported by a product called SuperTerm, and allows you to download Software. Both products are available from Midwest Micro Inc., 311 W. 72nd Street, Kansas City, MO64114 USA. The 64 terminal costs £29.95 but the price of the SuperTerm is not known as yet.

C64-Link is a modem which enables the 64 to transfer data to any other device, update Basic to 4.0, and have several 64s sharing IEEE devices, to communicate with other computers and networks and be compatible with CP/M. It is currently priced at \$185 and is available from Richvale Telecommunications, 10610 Bayview (Bayview Plaza), Richmond Hill, Ontario, Canada L4C 3N8. Tel: (416) 884-4165.

Com-In 64 is produced by Computer World of Holland. It is a communications cartridge which plugs into the 64 and enables it to do radio communications, program transmission and word-processing. There are a large number of features to Com-In 64. The user may send and receive messages or programs, and it supports disk, tape and most printers. There is a disk based Mailbox and messages may be edited as they are being received. Com-In 64 recognises over 60 different commands. It is priced at £99 and is available from Computer World, Hilvertsweg 99, 1214 JB, Hilversum, Holland, Tel: 31-3512633.

Fair shares

The Vic/64 switch is a neat black and white box measuring 10x4.5x2in. This device allows any number from one to eight Vics or 64s to share the same peripherals. Only standard CBM peripherals can be used, therefore only the 1540, 1541 drives and the 1515, 1525 and 1526 printers can be used with the switch.

The product was developed by a Swedish company called Handic, and is priced at £97.75. The cable, which comes in three different lengths, is priced at £4.30 plus VAT for 3 metres, £6.90 plus VAT for 6 metres and £8.90 plus VAT for 12 metres. The Vic/64 switch is sold in England by Kobra Micro Marketing and is available from Kobra Micro Marketing, PO Box 28, Henley-on-Thames, Oxon RG9 1PF, Tel: 04912-2512.

Hand-mod is also from the Swedish company,

Handic. It connects to the 64 via the User Port. It is a full duplex transmitting telephone modem and has a baud rate of 300 which is software controlled. Hand-mod can be used as a terminal for data transmission, a text link between several users and as an acoustic modem. It is available through Kobra Micro Marketing.

Han-com is also from Handic and is designed for use with Hand-mod or an RS-232C interface. Han-com transmits and receives upper and lower case letters, control codes and graphics. It is compatible with disk or tape. Both Hand-mod and Han-com will be available in August and the price has not yet been announced. Han-Com is also available from Handic through Kobra Micro Marketing.

Handic has also released a modem in cartridge form. This plugs directly into the user port. You can link to networks such as Prestel and View Data. It transfers at 1200 baud from a mainframe to the 64 and 75 baud from the 64 to the mainframe. It has an auto dial facility and a communications program.

Commodore and Prestel

Commodore is producing a Modem for the 64. It will be cartridge based and it will plug into the telephone.

Initially Micronet was to supply the 64 modem, but Commodore has decided to supply its own. It will allow you to link (for a fee) to networks like Prestel, giving you electronic shopping facilities, as well as public services information. Prestel also has a Mailbox system whereby users can leave messages for each other. There is also a bulletin board to leave questions and the ever popular games section. Some of the games will only cost you the price of a phone call, others will cost more.

Commodore is planning to start its own network which will be an electronic version of Vic Soft. It will be called Telesoft and will provide information on software and hardware for the 64 and demo previews of the products. You will be able to purchase products via credit cards, although a credit limit is likely to be imposed. To avoid piracy, Commodore is thinking of having a security key, so that any programs down-loaded will only work with the key in place. Presumably there will also be a mailbox service and a bulletin board. Prestel's joining fee is approx £50. Commodore's modem will be available in the Autumn priced at under £100.

An RS232 is a device enabling you to communicate with peripherals (such as modems) not usually available to your computer. Using an RS232 you can talk to other micros.

Commodore is producing an RS232 cartridge for the 64. It is called the Vic 1011A, and enables you to communicate with mainframe computers and use their software. The Vic 1011A plugs into the user port on the 64 and connects to the telephone via an acoustic coupler. You have to pay to log on and use time on network computers.

The cartridge can be used to connect a wide range of peripherals to the 64. The Vic 1011A will be available at the end of August and will be priced at £34.95.



VOLUME 9

SPRITES AND OTHER IMAGES

There's more to the 64 than meets the eye, but what meets the eye is more than enough to keep the most ardent programmer busy for a dozen midnight coding sessions.

And for Vic20 owners thinking of upgrading, there's more to graphics on the 64 than just learning a few new PEEKs and POKEs and coping with the 40-column screen. In fact, graphics programming on the 64 is so complicated that what follows can only be a quick guide to the possibilities.

The VIC II chip

The 6567 Video Interface Chip is at the heart of all graphics on the 64. This ingenious piece of silicon holds no less than 47 control registers with several registers handling more than one function.

The registers run from location 53248 to 53294 and allow you to select between three text modes, two high-resolution modes, and to control the sprite graphics. In addition, the VIC II chip controls screen output and graphics generation either from the 4K character generator in ROM or from user-defined sets in RAM. Screen colour is also handled by the 6567.

Graphics modes

When you first turn on the 64 you'll find the machine in standard character mode. Directly from the keyboard you have access to the full range of alphanumeric characters (both upper and lower case) plus the complete set of Pet block graphics. The video screen is made up of 1,000 locations in 25 rows of 40 columns. The start address of the screen is normally location 1024 but this can easily be changed by a POKE to register 53272 in the VIC II chip. There are 16 possible places to locate the screen memory, but care must be taken when POKEing to this register as it also controls the choice of character sets.

Each character is made up of an 8×8 grid of pixels. In standard character mode each character can be one of 16 colours on a background of one of 16 colours.

However, the 64 features a mode called extended background colour. For example, on a normal screen you could have a blue character on a white background. All characters would have the same background (ie, the screen colour). In extended background colour mode you can control the background of each character, so you could have any of sixteen background colours to your blue character without affecting the screen colour.

You can also select two kinds of high-resolution screen on the 64. The first, standard bit map mode, gives a resolution of 320×200 pixels with a choice of two colours in each 8×8 section. To gain a greater colour resolution, you can use multi-colour bit map mode.

This halves the horizontal resolution since each pixel is twice as wide, but you can now have four colours in each 8×8 section of the screen.

User-defined graphics

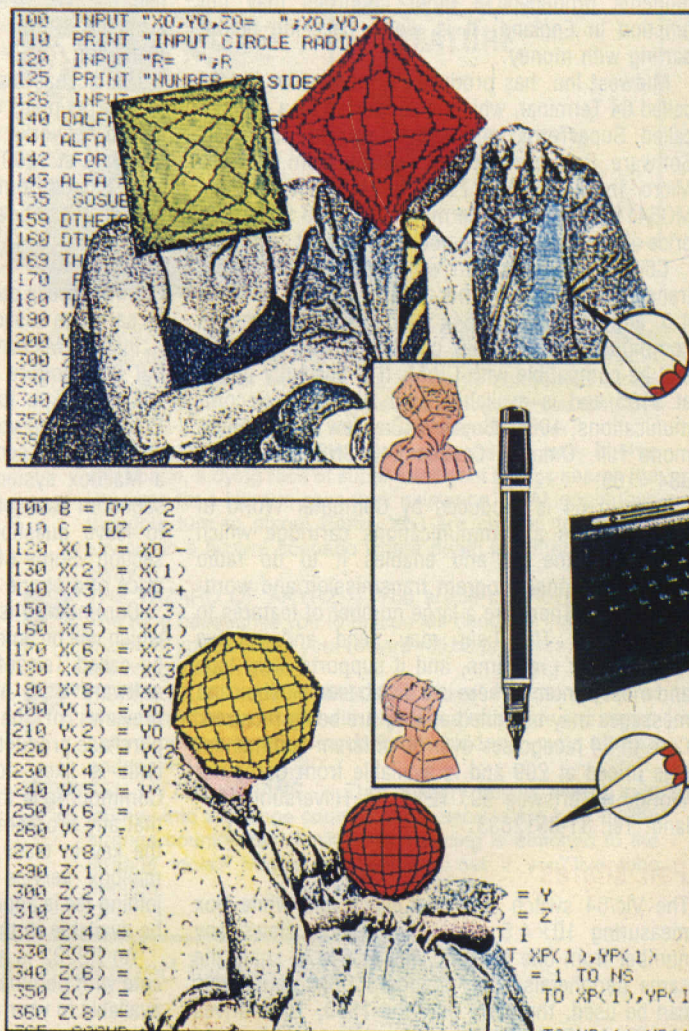
Although it is possible to create effective displays using only the block graphics facility on the 64, greater things await you if you use your own characters. The process of defining your own graphics on the 64 is identical to that used on most computers, especially the Vic, although certain initial steps must be taken.

The location of character memory is held in register 53272, so by altering the contents of this it is possible to create your own characters in RAM and display them on screen. There are eight possible locations for the character set but the VIC II chip already has two of these filled.

One of the complications with the 64 is that it is possible to have two different things in the same place in memory. This is because some of

the memory contents are in ROM and can be switched in and out by the VIC II chip, and the 6510 main processor is blind to some of these operations. This technique, known as paging, is essential to using the 64 to the full and you should become familiar with it.

Having changed to an address at which the VIC II chip gets its characters, you can then define your own by POKEing values into RAM (for a full explanation of this see PCN's Graphics Micropaedia, Issues 6 to 10).



Scrolling

Another advantage the VIC II chip has over its predecessor in the Vic20 is the ability to control high resolution scrolling. This ability allows you to move the screen image one pixel at a time. Further, you can do this vertically, horizontally, and, by combining the two, diagonally in any direction.

The snag is that it must be done in machine code to achieve a truly smooth effect. The scrolling is done as follows. First, the 64 shrinks the screen by a character in each direction (actually, it is the border which expands). This makes room to place the character which is to appear on screen. The scrolling register is then adjusted so that one row of pixels in

the new character appears, and this is done eight times until the whole of the character is on screen.

Finally, the entire screen must be shifted in the desired direction and the scrolling register set to zero. This is the step that requires machine code to avoid a hiccup in the display.

Sprites

The facility for sprite graphics has become perhaps the best known feature of the 64, although there is one more trick in the box that allows even more impressive results. However, sprites are a remarkably useful graphics effect that greatly simplify animation.

You can think of sprites as creatures that inhabit another plane in the

Location 53266 of the VIC II chip is the raster register. The raster is the beam that constantly moves across the video screen causing the image to be displayed. It covers the whole screen 60 times every second.

The 64 allows you to 'ask' the raster when it gets to a certain point on the screen. The raster will interrupt the VIC II chip when it reaches that point and the VIC II chip can then be programmed to switch modes.

What all this means is that you can set up the screen to have high resolution in one part, standard text in another, and multi-colour graphics in a third. All modes appear simultaneously because of the phenomenal speed at which it all takes place.

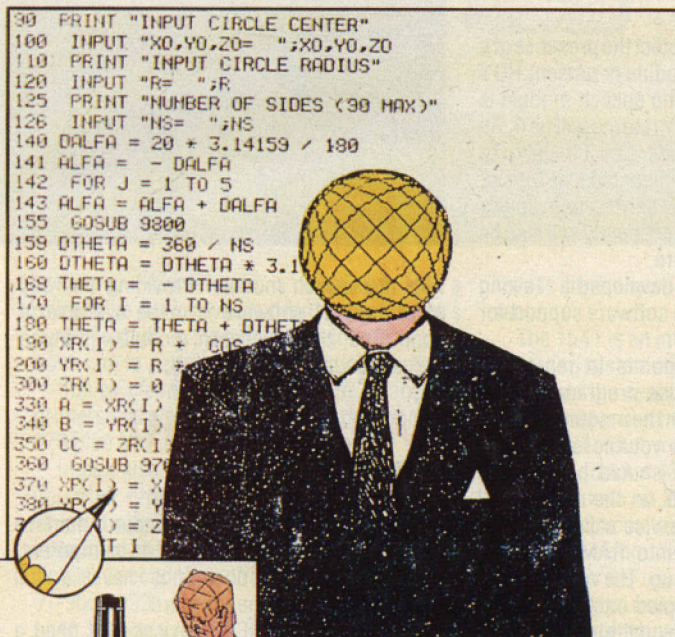
And that is why you need to use machine code. Basic is just too slow; by the time a Basic program has got an answer to all the required checks the raster is well past the point where you want to switch modes.

From all the above you can see that virtually any graphics effect you care to program is possible on the 64. The snag is that, at the moment, you have to do it all by POKEing the various registers — but graphic aids are becoming available.

The VIC II Registers

Register	Effect
53248	Sprite 0 horizontal position
53249	Sprite 0 vertical position
53250	Sprite 1 horizontal
53251	Sprite 1 vertical
53252	Sprite 2 horizontal
53253	Sprite 2 vertical
53254	Sprite 3 horizontal
53255	Sprite 3 vertical
53256	Sprite 4 horizontal
53257	Sprite 4 vertical
53258	Sprite 5 horizontal
53259	Sprite 5 vertical
53260	Sprite 6 horizontal
53261	Sprite 6 vertical
53262	Sprite 7 horizontal
53263	Sprite 7 vertical
53264	Extended horizontal coordinate*
53265	Vertical scrolling register
53266	Raster register
53267	Light pen horizontal position
53268	Light pen vertical position
53269	Set sprites on/off
53270	Horizontal scrolling register
53271	Expand sprite vertically
53272	High nybble sets screen address, low nybble sets character memory address
53273	Interrupt request
53274	Interrupt request masks
53275	Set background-sprite priority
53276	Select multicolour sprites
53277	Expand sprite horizontally
53278	Detect sprite-sprite collision
53279	Detect sprite-background collision
53280	Set border colour
53281	Set screen colour
53282	Background colour 1
53283	Background colour 2
53284	Background colour 3
53285	Sprite colour 0, multicolour mode
53286	Sprite colour 1, multicolour mode
53287	Set colour of sprite 0
53288	Set colour of sprite 1
53289	Set colour of sprite 2
53290	Set colour of sprite 3
53291	Set colour of sprite 4
53292	Set colour of sprite 5
53293	Set colour of sprite 6
53294	Set colour of sprite 7

*Because each register can only hold numbers up to 255 and the high resolution screen goes up to 320 pixels, an additional register is required to maintain the horizontal position of the sprites. By setting 53264, the VIC II counts positions above 255 as position 0 onwards.



VIC II chip. They are user-definable and can easily be moved about the screen, but without disturbing any other part of the display. This last attribute means you can move a sprite in front of or behind the main screen display.

Sprites are defined in exactly the same way as other graphics characters except that they occupy a 24×21 grid. You can set each sprite to a different colour, or use multicolour mode, magnify individual sprites horizontally, vertically or both, and detect collisions between sprites, and

between sprites and background.

Furthermore, sprites have a fixed priority, which means that sprite 0 will appear closer than sprite 1 and so on, giving a 3D effect. Finally you can select priority between sprites and background so that they appear in front of or behind the main display.

The VIC II chip has separate registers to control the position of sprites on screen, so moving them is a simple process. Sprites can also be generated behind the border so you can fine-scroll them into view.

Generally you can define up to eight sprites, but by manipulating certain of the video registers and using machine code to page memory and control the sprites, you can have many more.

Each sprite has its own set of registers for colour, position and size, which makes control very easy. For example, you could define a sprite in four different sizes then, by alternately doubling the size and displaying the bigger version, present an image in eight sizes, giving a very effective 3D display.

Multi-mode graphics

This is possibly the greatest graphics effect on the 64. Unfortunately, for reasons which will become clear, it is possible only in machine code.

EXPANSION FACTORS

THE TALKING COMMODORE

Commodore has produced a speech synthesis cartridge with a top loading port so that other cartridges may be used simultaneously with the speech module. Commodore claims that the product is revolutionary, and that the module will simulate male, female and children's voices.

It's features include simultaneous voice and music generation, simultaneous voice and graphics display (programmable from Basic), a preprogrammed vocabulary of over 200 words, additional vocabulary on disk and compatibility with other cartridges.

Using the module from Basic the user has four speech oriented commands which can utilise the vocabulary. The first of these commands is SAY, which accepts either a string or a numeric argument to represent the word, for example:

SAY"hello" (says hello)

B\$="hello"

SAY B\$ (says hello)

SAY 21 (says hello)

A=21

SAY A (says hello)

SAY(3*7) (says hello)

Clearly the module is very flexible. If you wrote your Basic program, you could of course incorporate the words in data statements.

The RATE command sets the speed the words are spoken at, in a range from one to ten. The standard rate of speech is four and the slowest is ten, the range varying from 0.65 times slower than the standard rate to 1.4 times faster than the standard rate. This command can be presented as a numeric argument only, for example:

FOR I=1 TO 10

RATE (I):REM SET SPEED

SAY "hello"

NEXT I

The VOC command is used to inform the module that additional vocabulary has been added from disk, tape or in ROM. It can't be used if there is no additional vocabulary. An example of loading extra vocabulary from disk and informing the module might be:

LOAD"EXTRA",8,1

EXTRA=32768:REM START ADDRESS

VOC(EXTRA):REM INFORM MODULE

After the new vocabulary has been loaded and initialised it can then be accessed and the words used.

The RDY command is a logical function; its purpose is to return the value true if the speech

module is ready to accept another SAY command.

It may also be used to detect the presence of a speech module. If the module is present RDY returns a value of -1, if no speech module is present then the value RDY returns will be 0. All of these Basic commands can be used to produce programs containing speech, music, sound effects, graphics, sprites and colour together. The additional vocabulary will also be available from Commodore.

Commodore has also developed a 'Talking Book' to demonstrate the software support for the module.

There are important points to remember when writing machine code programs for the module. On power up with the module in place, the SID chip is set to a volume of 15. Any alteration of the volume should be restored before attempting speech, as the module will not reset the volume. Service calls to handle user programs are put into RAM from Hex \$C000—\$C3FF at power up. The vocabulary of the speech module is copied into RAM under the Basic and Kernal ROMs. If the user is relying on the built in vocabulary, it is important not to disturb RAM from Hex \$A000 — \$C3FF. The following zero page Hex locations are used during the voice synthesis process:

Speech data stream pointer	\$FB5 — FC
Speech look up table	\$BD — BE
Upper/Lower nibble flag	\$FD
Decode table pointer	\$9B — \$9C
Vector Template pointer	\$A7 — \$A8

The first routine is SRESET — this resets the module, the entry point being at Hex \$C003. The routine to return the current status of the module is SPSTAT. The entry point is Hex \$C006, and a value of -1 will be returned in the accumulator if the module is busy and 0 if it is ready. The routine to initiate the synthesis of a word is SAYIT, with the entry point at Hex \$C009. The X register contains the MSB and the A register the LSB.

It is important not to use any other process that generates NMI's. Programs wishing to perform I/O or serial bus operations should use SPSTAT to ensure that speech output is complete. To generate speech from RAM the command SAYRAM is used. Unlike SAYIT it allows the user to bypass the memory mapping system, allowing access to RAM based speech, and the entry point is Hex \$C00C. To speed up or slow down the rate of speech the command SPEED is used, with the entry point at Hex \$C00F.

Commodore is at present developing a disk based vocabulary of over 1,000 words and phrases, and a version of this will be available



with the speech module. Providing this and other support software is made available in good time, the 64 speech module will be an exciting and excellent product.

MAKE THE RIGHT CONNECTIONS

The IEEE is Commodore's standard interface for connecting peripherals to its computers, although the 64 does not have a full implementation of the standard.

In order to use IEEE devices you need a suitable interface cartridge. The first of these to appear for the 64 was the IEEE 488 from Dams. This looks a little ungainly when connected to the 64's cartridge slot but the board is well made and seems very sturdy.

You simply plug it in, power up, and hook up the peripherals of your choice. With this cartridge in place, you can use the full range of Commodore printers, plus the 3040, 4040 and 8050 disk drives.

You can also use Epson's FX80, RX80 and MX100III printers.

However, there is a major problem with the Dams cartridge. The software program to drive the device starts at location 49152 and this is an area much used by commercial software. For example, this would preclude you using PaperClip 64 with the Dams interface.

If you feel this would not be a problem, or feel confident of being able to relocate the code, it will cost you £59.95 from Dams Office Equipment, Gores Road, Kirkby Industrial Estate, Kirkby, Liverpool, tel 051-548 7111.

Commodore's own IEEE cartridge for the 64 will be available from September. Like Dams' version, it allows access to all of the 3000 and 4000 series peripherals but its code is relocatable.

It also comes with an additional cartridge slot so you can use other cartridge software while the interface and peripherals are plugged in. It is also cheaper at £34.95.

A third alternative comes from Impex which deals mainly in hardware and business



software. This is not a cartridge but a switchable device which connects to the 64's serial port via a 5ft cable. The interface then hooks up to a printer via a 36-pin connector.

Impex claims it will work with a range of printers and plotters but it may be overpriced at £79 plus VAT.

Impex also handles a number of American imported products from Cardco Inc, one of which is a printer interface. Prices have not yet been fixed but you can contact Impex at Metro House, Second Way, Wembley, Middlesex, tel 01-900 0999.

At the deluxe end of the market comes Interpod from Oxford Computer Systems. Interpod has a full implementation of both the IEEE and RS232C interfaces. This allows you to connect any Commodore peripheral plus a wide range of other products to your 64.

The device is entirely transparent and uses none of the 64's memory but there are problems in that there is no reset switch and since some software seems to be incompatible with Interpod, a systems crash means you have to unplug the whole unit.

It currently costs £125 plus VAT from Oxford Computer Systems, Hensington Road, Woodstock, Oxford, tel 0993-812700.

Across the Atlantic, Microware can supply an interface for the 64. This is a 'universal' parallel interface that will allow you to use a range of Centronics-type printers. The interface hooks up to the user port, leaving the cartridge slot free and an extended graphics option is available.

It costs \$19.95 from Microware Distributing Inc, 1342 B Rt. 23, Butler, New Jersey 07405, USA, tel 210-838 9027.

ALTERNATIVES FOR PLUG-IN POWER

Disk drives. The 1541 is the least expensive drive for the 64. It is a single drive, using single density, 40-track 5.25 inch diskettes, each diskette can hold approx 170,000 (170K) bytes of information and Commodore claims an

access time anywhere on the diskette of two seconds.

The 1541 is an intelligent drive, with its own operating system and a 2K Buffer. It connects to the 64 via the serial port and up to four drives plus a printer can be daisy-chained together.

The 1541 is currently priced at £299.95.

Commodore's 4040 disk drive may be used on the 64 with an IEEE or serial interface. The storage capacity is the same as the 1541, the difference being that the 4040 is a dual drive. This allows the use of software requiring two drives and also makes it easier to backup disks.

The real difference is in the price — the 4040 retails at £695 plus VAT.

The 64 will also take a hard disk via Interpod. Commodore is marketing two hard disks at present: the 9060, which has 5Mb capacity and retails at £1,995 plus VAT, and the 9090 hard disk which has 7.5Mb and costs £2,495 plus VAT.

Printers. The two printers directly connectable to the 64 are the 1525 and the 1526, both from Commodore. These printers can be connected to the 64's serial port or to the 1541 drive.

The 1525 is a dot matrix tractor-feed printer. It will print the full range of the 64 character set, including the graphics characters, and also allows reverse printing to highlight text and large characters for headings. The print rate is 30 characters per second.

The 1525 comes with a manual and leads, it is currently priced at £230.

The 1526 printer, which has been temporarily withdrawn for alterations, is also a dot matrix printer, offering the same facilities as the 1525. Additional features include custom line spacing, margin and page lengths, as well as automatic line counting, error diagnostics and print head protection.

The print rate is 60 characters per second, for a price of £345.

A comprehensive range of printers may be used with the 64 via an interface.

From Epson come three printers. The MX-100III, which can be interfaced via an RS232C or IEEE 488 interface, offers a printing rate of 100 characters per second, bidirectional

printing and adjustable tractor feed. It has five printing sizes or can be programmed. Cost £499.

The FX80 is a dot matrix printer with a bidirectional print rate of 160 characters per second. As with the MX100, it outputs the full 96 ASCII character set on a 9 × 9 matrix. It supports six different printing sizes and uses fanfold paper, cut sheet and roll paper. It is currently priced at £438.

The RX80 is a cheaper version of the FX80, with a reduced print rate of 100 characters per second. Only normal and italic character types are available in an 11 × 9 matrix but the cost comes down to £298.

Plotters. The CBM 1520 printer/plotter is now available for the 64. It uses 4½in roll paper in a 5in carriage. It has a four-colour print head with black, blue, green and red pens. High-resolution figures are possible with the plotter's ability to 'step' up to 480 positions horizontally and 999 positions vertically.

The 1520 is priced at £170 from Commodore dealers.

For those wishing to use a more powerful and more expensive plotter on the 64, Hewlett Packard's 7470A (option 002) plotter may be used.

The 7470A has two pens, uses A4 paper on a roller and the resolution is 0.025mm. It plots 1,000 points on a 1in line, output rate is 38cm per second with five character sets and 40 graphic instructions.

The 7470A costs £1,220 plus VAT and is available from Sumlock Bondain, 263 City Road, London EC1, tel 01-250 0505.

Cassette decks. The cassette deck recommended for use with the 64 is Commodore's 1530 C2N. Although there are a few interfaces around that will allow you to use most audio tape recorders, the reliability of these interfaces is not known whereas the reliability of the 1530 is virtually assured and certainly well tested.

The deck comes with a lead which connects to the 64's cassette port, no power supply needed, and features a tape counter and a recording light (when saving). It uses standard audio cassettes.

PROGRAM BREAKDOWN

Program 1 uses voice 1 to produce a few notes.

Line 10 Sets SID to 54272 and clears all the SID chip registers.

Line 20 Sets attack and decay for voice 1.

Line 30 Sets the volume to 15 (max).

Line 40 Reads the high frequency, low frequency and the duration of the note.

Line 50 Ends the program if the high frequency is less than zero.

Line 60 Sets the high frequency and the low frequency of voice 1.

Line 70 Selects the sawtooth waveform for voice 1.

Line 80 Timing loop for duration.

Line 90 Release sawtooth waveform for voice 1.

Line 100 Gets the next note.

Line 110-180 The song data. The sequence is high frequency, low frequency and duration.

Line 190 The final note and negatives to end song.

Program 2 uses all three voices simultaneously.

Line 10 Sets the variable SID to 54272 and clears the registers.

Line 20 Sets attack and decay for voice 1.

Line 30 Sets attack and decay for voice 2.

Line 40 Sets attack and decay for voice 3.

Line 50 Turns the volume on to maximum.

Line 60 Reads in the data (high and low frequencies and the duration of the note).

Line 70 Ends the program if the high frequency is negative.

Line 80 POKes in the high and low frequency for voice 1.

Line 90 POKes in the high and low frequency for voice 2.

Line 100 POKes in the high and low frequency for voice 3.

Line 110 Sets voice 1 to triangle waveform.

Line 120 Sets voice 2 to sawtooth waveform.

Line 130 Sets voice 3 to pulse waveform.

Line 140 is a duration loop.

Line 150 Releases waveform in voice 1.

Line 160 Releases waveform in voice 2.

Line 170 Releases waveform in voice 3.

Line 180 Returns to read in the next note.

Line 190-270 is the data for the song, with the ending negatives in Line 270.

64 SOUNDS

The 64 has a 6581 chip, more commonly known as the SID (Sound Interface Device) chip. The SID chip is more than a sound generator when compared to the Spectrum or even the Vic 20. It has three voices, all addressable, and four waveforms. The SID chip also has attack, decay, sustain, release, filtering and modulation for each voice.

The Vic 20 has three voices, and a white noise generator which is similar to the 64's. The setting of the voices and the volume is handled in a similar way to the 64, with a series of PEEKs and POKes. That is where the similarity ends, as the 64 has the added features one would expect of a synthesiser, but you have to create and control each note unlike on most other machines.

Each of the SID chip's voices has provision to input a high and a low frequency for each voice. This gives the note the correct vibration. There can be great variation in the intensity of notes. The first part of the note is known as the attack — this means the rate at which the note rises to its peak. The quicker the attack, the more twangy the note becomes. The second part of the note is the decay, which is the rate at which the note descends from its peak. The next part is the sustain, which is the length of the main body of the note. The final part is the release phase, which may vary in its rate as the attack does. By setting different combinations of these four features an enormous variety and complexity of sounds can be produced.

Another of the SID's features is the waveforms. Each of the three voices may be set to any one of four waveforms. This allows the user to vary the quality of the tone as produced by different musical instruments. The waveforms are: triangle, pulse, sawtooth and white noise (probably best suited for sound effects and games). The pulse waveform can be varied by altering the length of the pulses that make up the waveform. The notes may also be filtered, which alters the volume of the frequencies with a note, leaving others untouched.

The addresses

The locations used on the 64 to create and control music or sounds are from 54272 (\$D400) to 54296 (\$D418). By POKeing the appropriate values into a combination of these addresses, the user may build up a sequence of sounds or songs. Probably the first thing to do in any program or routine that uses sound is to clear all of the registers. The following line will achieve this and can be used to reset the SID chip at any time: 10 SID = 54272: FOR CLR = SID TO SID + 24: POKE CLR,0: NEXT

This will clear the SID's registers, preparing them for use.

Software

There are now a few software packages available for the 64 that extend Basic. Simons Basic is produced and marketed by Commodore Business Machines, and costs £50. The extra music commands added to normal Basic by the package do not make full use of the SID chip's abilities. However, the cartridge supplies music commands to introduce the user to programming sound on the 64, and the manual refers the competent user to the numerous books on programming sound.

The music commands

To set the Volume the command is simply VOL *n* where *n* is a number in the range 0-15. The command WAVE allows the user to select the type of waveform. The format it uses is: WAVE *voice number, binary number*. To set a triangular waveform for voice 1 the command would be WAVE 1,000010000.

The second parameter is in binary notation. The ENVELOPE command allows the user to set the attack, decay, sustain and release for any voice, with the format ENVELOPE *vn,a,d,s,r* where *vn* is the voice, *a* is the rate of attack, *d* is the rate of decay, *s* is the length the note is sustained for and *r* is the rate of release.

TABLE 1

Voice	Setting	Triangle	Sawtooth	Pulse	Noise
1	54276	17	33	65	129
2	54283	17	33	65	129
3	54290	17	33	65	129

TABLE 2

Voice	Start	Waveforms	Decay	Attack	Sustain	Release
1	54272	54274-54276	54277	54277	54278	54278
2	54279	54281-54283	54284	54284	54285	54285
3	54286	54288-54290	54291	54291	54292	54292

Locations 54293-54295 are the filter control and cutoff addresses. Location 54296 is the volume control ranging from 0-15.

There are two other music commands, MUSIC and PLAY. Music allows the user to compose and play music. The format for use is MUSIC *n*, "music string" or MUSIC *n*, variable + variable + variable. This is a fairly powerful command and can be used to compose a long sequence of notes that are entered using the function keys.

The last command, PLAY, has the format PLAY *n*. The parameter *n* can be from 0-2. Using 0 turns off the music and using 1 PLAYS the music before continuing the program. PLAY 2 plays the music and continues program execution.

Synthy-64 was written by Roy Wainwright and produced by Abacus Software in America. It is currently available in England, but it is unclear who is marketing it and at what price. It retails at £7-£14 and comes on cassette but supports both cassette and disk.

The main body of the program is machine code. Having loaded this the user can load and run the demo program, which gives three tunes and an example of the TRACE function. Probably the best way for the novice to start with this package is to RUN the demos and examine their structure. The package comes with a manual which is A4 size and about 40 pages long.

Synthy-64 eliminates the need to use the various POKE and PEEK statements to create sound and music. Instead the user can enter sounds or musical creations or even sheet music in a form of musical notation.

There are a whole range of commands. The music commands include RUN (Clr home), which must be the first statement in any program. The other fundamental music command is *vo/dm*, where *v* is a note value, *o* is an octave number, *d* is a note duration and *m* is a note value modifier.

For the note value any of the usual musical notes may be used. For example, C, C£, A, A\$ etc. The Octave number specifies which of the eight octaves is to be used with the note, C6 will play a C note in the sixth Octave. The note duration is specified by *a/n*, where *n* signifies the time that note is played or a rest. C5/5 is middle C, quarter note. Note duration modifiers are specified by adding ' ' or '!' or '!'. These commands allow the user to play a double or a triple note. Other commands available on Synthy 64 allow the user to set volume tempo and control the program.

PROGRAM 1

```
10 SID = 54272:FOR CLE = SID TO SID + 24:POKE CLE,0:NEXT
20 POKE SID+5,9:POKE SID+6,0
30 POKE SID+24,15
40 READ HI,LO,DU
50 IF HI < 0 THEN END
60 POKE SID+1,HI:POKE SID,LO
70 POKE SID+4,33
80 FOR DEL = 1 TO DU:NEXT
90 POKE SID+4,32:FOR DEL = 1 TO 50:NEXT
100 GOTO 40
110 DATA25,177,250,28,214,250
120 DATA25,177,250,28,177,250
130 DATA25,177,250,28,214,125
140 DATA32,94,750,25,177,250
150 DATA28,214,250,19,63,250
160 DATA19,63,250,19,63,250
170 DATA21,154,63,24,63,63
180 DATA25,177,250,24,63,125
190 DATA19,63,250,-1,-1,-1
```

PROGRAM 2

```
10 SID = 54272:FOR CLE = SID TO SID + 24:POKE CLE,0:NEXT
20 POKE SID+5,9:POKE SID+6,9:REM ATTACK AND DECAY FOR
  VOICE 1
30 POKE SID+12,15:POKE SID+13,0:REM ATTACK AND DECAY
  FOR VOICE 2
40 POKE SID+19,9:POKE SID+20,20:REM ATTACK AND DECAY
  FOR VOICE 3
50 POKE SID+24,15
60 READ HI,LO,DU
70 IF HI < 0 THEN END
80 POKE SID+1,HI:POKE SID,LO:REM HI & LO FREQ FOR 1
90 POKE SID+8,HI:POKE SID+7,LO:REM HI & LO FREQ FOR 2
100 POKE SID+15,HI:POKE SID+14,LO:REM HI & LO FREQ FOR 3
110 POKE SID+4,17:REM VOICE 1 TRIANGLE
120 POKE SID+11,33:REM VOICE 2 SAWTOOTH
130 POKE SID+18,65:REM VOICE 3 PULSE
140 FOR DEL = 1 TO DU:NEXT
150 POKE SID+4,32:FOR DEL = 1 TO 50:NEXT
160 POKE SID+11,32:FOR DEL = 1 TO 50:NEXT
170 POKE SID+18,32:FOR DEL = 1 TO 50:NEXT
180 GOTO60
190 DATA25,177,200,28,214,200
200 DATA25,177,200,28,177,200
210 DATA25,177,200,28,214,100
220 DATA32,94,200,25,177,200
230 DATA28,214,200,19,63,200
240 DATA19,63,200,19,63,200
250 DATA21,154,50,24,63,50
260 DATA25,177,200,24,63,100
270 DATA19,63,200,-1,-1,-1
```

PROGRAM 3

```
10 S1 = 54272:REM VOICE 1
20 S2 = 54279:REM VOICE 2
30 S3 = 54286:REM VOICE 3
40 FL = 54293:REM FILTER LO BYTE
50 FH = 54294:REM FILTER HI BYTE
60 RS = 54295:REM RESONANCE
70 PL = 54296:REM FILTER PASS AND VOLUME
80 POKE S1+4,0:POKE S2+4,0:POKE S3+4,0
100 A = 15:D = 0:S = 8:R = 13:H = 8000
110 POKE RS,0:POKE PL,15
120 POKE S3,0:POKE S1+1,30
130 POKE S2,0:POKE S2+1,1
140 POKE S3,0:POKE S3+1,100
150 POKE S1+5,16*A+D:POKE S1+6,16*S+R
160 POKE S1+4,129:POKE S3+4,23
170 FOR I = 0 TO H:NEXT
180 POKE S1+4,128:POKE S3+4,16
```

Table 1 gives the addresses of the three voices. Each voice can have one of three waveforms: triangle, sawtooth, pulse and white noise. Table 2 gives the numbers that, when POKEd into the addresses, will select the waveform for each voice. The waveform settings are the same, but the control address for each voice is different. Altering the waveforms will produce a different tone or quality to that voice. In this way it is possible to imitate an accordion, piano or even a string section.

PLAY UP AND PLAY GAMES

A good game should keep you playing for hours and make as much use of the 64's capabilities as possible.

Fortunately, many such games are currently in production and lot's more are on the way. So a good time can be had by all if you scan the shops carefully. Below we've selected a few of the best produced so far.

64 GAMES

Enniax

This disk-based game is another in the long line of space war types. It is very quick and has a good response time. You can set the terrain, choose from four levels of play and make the game more difficult by having the missiles ricochet.

The colour, sound and graphics combine to give you a real challenge.

The program records the four highest scores and will keep you glued to the screen. Enniax is priced at £19.95 and is available from Impex Designs (UK), Metro House, Second Way, Wembley, Middlesex HA9 0TY, tel 01-900 0999.

64 GAMES

Attack of the Mutant Camels

An intriguing variation on the space wars theme, this cassette-based game from Llama-soft has 31 levels of difficulty and can handle one or two players.

As usual, you control a ship and must defend the Earth from some pretty non-standard space invaders: giant camels.

Your ship is extremely manoeuvrable and

controlled by joystick and the scenario is taken from The Empire Strikes Back. The game makes good use of sound and colour and the sound is particularly interesting as it generates a different sound effect for each of the types of weapons controlled by the invaders.

The game is tightly programmed and currently popular, although it could eventually get tedious.

It sells for £8.50 and is produced by Llamasoft Software, 49 Mount Pleasant, Tadley, Hants, RG26 6BN.

64 GAMES

Motor Mania

Another classic: road games on micros have been around for some time, but this is one of the first to make it to the 64.

You use a joystick to control your car and the road varies between 'A' and 'B' roads and dirt tracks, with the occasional opportunity to cross major roads. You must avoid hitting the side of the road, other cars and various hazards.

Those hazards include a wailing fire engine and an avalanche. The fire engine often races down the road you're trying to cross, while the avalanche descends on your car at random. There are three gauges: one for fuel, one for miles travelled and one for the generator. If your fuel is low, you can refuel at a garage—and that same garage can be used to repair the car when it's not fatally damaged.

You have five lives, but you'll have to spend them carefully as the Commodore course is tough going. Graphics on the game are excellent, although sound is not particularly exceptional.

Motor Mania is available on cassette for £8.95 from Audiogenic, PO Box 88, Reading, Berkshire, tel 0734-586334.

Monopole

Rabbit Software's Monopole is a complete reproduction of the traditional board game and makes good use of the 64's graphics and sound capabilities.

It's a two-player game although there isn't an option to play the computer, but it does take a lot of the tedium (and argument) out of playing

the game.

The screen presents a complete picture of the monopoly board — including Community Chest and Chance cards — and even a police siren when you're sent to jail.

Monopole sells for £9.99 and is available by mail from Rabbit Software, 380 Station Road, Harrow, Middlesex, HA1 2DE, tel 01-863 0833.

64 GAMES

Grand Master

This latest version of chess for the 64 is cassette-based and has a large number of special functions including control of border and background colour, ten levels of play, castling, the ability to take back a move and an 'advice' feature where the program will give you playing hints (although the wisdom of this is dubious as the program could give you false hints and throw you off the track).

The use of colour and graphics is good and the manual is quite adequate for the purpose. Grand Master is certainly a formidable opponent and its time comes cheap at £17.95.

It's available from Audiogenic.

Jumpman

Jumpman is a disk-based game that requires a joystick and a lot of thought. It uses the Commodore's capabilities to the full, and must be experienced if only once (borrow a disk drive).

With nine alterable speeds, 31 levels and five modes of play, Jumpman will keep you up into the early morning (have a go at the Randomiser Mode). The graphics, sound and colour are brilliant.

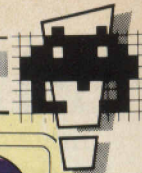
Jumpman comes complete with manual for £27.50 from Maplin Electronics Supplies, PO Box 3, Rayleigh, Essex, SS6 8LR, tel 0702-554155.

Kevin Bergin, Pete Gerrard, Geof Wheelwright, Peter Worlock
Design: Nigel Wingrove
Photography: Naru
Illustrator: Simon Edwards

NEXT WEEK

We begin a three-part series on the Dragon Data 32. It tells you how to make the most of this inexpensive micro, which has just acquired the ability to run disk drives. At between £150 and £175, it's one of the cheapest machines to feature disk drives, a full-travel keyboard and standard printers.

We start with some of the history behind the development of the Dragon, a look inside the machine and an introduction to Dragon Basic. And in the following two weeks you'll get the low-down on software and peripherals.



ZX ADVENTURES

SPECTRUM

Under the hill

Name Magic Mountain System
Spectrum 48K **Price** £4.95
Publisher Phipps Associates, 172 Kingston Rd, Ewell, Surrey, 01-393 0283 **Format** Cassette **Outlets** Mail order, computer shops.

Magic Mountain has been played on the ZX81 for two years and has been restyled with new graphics for the Spectrum.

Objectives

A sort of alter-ego introduces himself as your eyes and limbs, but you've got all the initiative. Your task is to direct your nameless chum to the Scroll of Wisdom secreted in the mountain. This journey is fraught, of course, with hidden traps and perils and your progress in overcoming these challenges scores you points out of 1,600.

While the program finishes loading, an impressively impregnable-looking mountain looms on the screen. During the game the colour graphics are very neat, with split-screen pictures used for many locations.

The first screen draws you a tunnel at the foot of the mountain in one half, while the other is used for you to conduct fast and fulsome conversations with the nameless chum. A wealth of caves of the hidden, musty and cold variety await you, along with all the other trappings of magic.

In play

A couple of pages of instructions and then you set off along what can become a weary, frustrating, baffling and very enjoyable trail.

The exasperation was exacerbated when I'd got him through a door and was trying very, very hard to cut a bamboo cane. Whereupon, after much fruitless effort, he inquired kindly, but thoughtlessly, if I were trying to open the door!

But then my short temper did get him killed by a dwarf. And my incorrect command to a genie saw the genie disappear, leaving behind a familiar and unpleasant smell. Death lies around many corners, and not usually as well deserved as in the dwarf incident.

The red and black maze took much patience and ingenuity, while the nameless chum stayed cool as a cucumber and refused to understand 'panic'.





Verdict

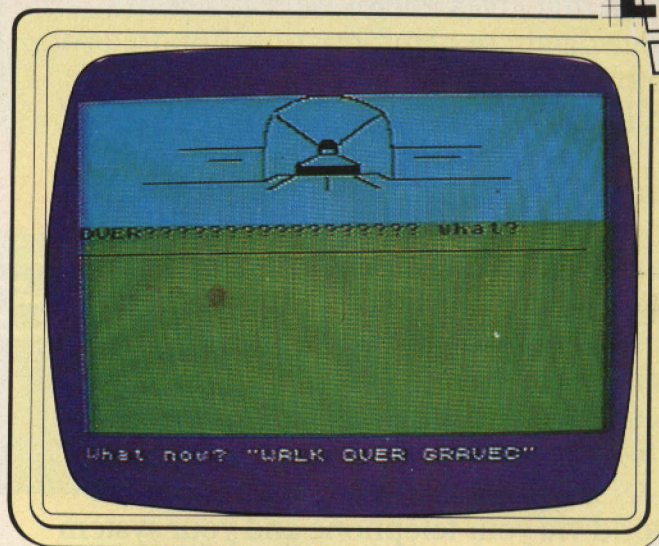
After much more of this sort of thing you'll find the way around and you'll learn what to collect when, and when to wear it. You'll find some clues obvious and others non-existent.

The graphics are neat and distinct, the responses reasonably fast and the challenge is well, but not too well, within the bounds of possibility. Baffled from early on you may be, but not bored.

Harriet Arnold

RATING

Lasting appeal 
Playability 
Use of machine 
Value for money 



SPECTRUM

Pieces of eight

Name Smugglers Cove System
Spectrum, 48K **Price** £6.95
Publisher Quicksilver, 0703 20169
Format Cassette **Outlets** Mail order, Sinclair dealers.

The year is 1753. Two miles off the north Cornish coast, huge waves pound the latest victim of the notorious Doombur, the cutter captained by the ruthless pirate Blackbeard. You are of course well aware of the rumours of the hidden hoard of Blackbeard's treasure, and the terrible tales of those who have tried to find it...

Objectives

But as well as tracking down the treasure, you have to find your way out of the maze of caves where the hoard lies hidden. And no, you can't get out the way you got in, because you have just slipped and fallen twenty feet to the floor of a cave.

In play

Getting started with this game is virtually impossible. You can get as far as finding five or six rooms, but you can't do anything once you have found them, unless you have gone through a complicated and unlikely sequence of actions, and all in the right order.

Without finding the whatshammycallit, as well as the other thingy, you can't climb the wheresit. Unless you climb the wheresit, you won't find the

doobrey. Without the doobrey, you can't cross the wheredidyou say to find the somethingorother. But to collect the somethingorother, you will need to have done something outlandish earlier with yetanotherobject in order to avoid being eaten by the whatsit.

The whole game is couched in eighteenth century Cornish-speak. 'Argh, Jim lad. There be a barrel here!' it growls at you. And it addresses you as 'Scupper' and 'Me lovely' as it tells you that it 'Can't do that.'

The graphics are nothing to write home about, but the pictures of the various locations are drawn fairly fast, and they're good enough to give you an idea of where you are.





Reincarnations are random, courtesy of a routine that asks you for your date of birth after you have been eaten/flattened/zapped by magic or whatever. More often than not, the program decided to leave me dead, so do be sure to save the game if you manage to get beyond first base with it!

Verdict

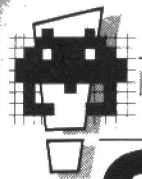
The first rule of adventure-writing has to be to lead the player on far enough to get him hooked before you start making things difficult for him. Getting anywhere at all with this game is just too hard, and there's only one solution to most of the problems. Sure, it will give you hours of happy fun — if you don't mind wandering round and round in circles. Just like life, in fact.

Shirley Fawcett

RATING

Lasting appeal 
Playability 
Use of machine 
Value for money 





Mike Gerrard and Steven McClure set up a two-man defence against the latest Sinclair hordes.

Sporting Spectrum

Spectrum games keep coming thick and fast — some of them more thick than fast, it must be said. But this latest consignment includes at least a couple that match arcade standards and even one in which it's your shout — you literally call the shots! Start yomping . . .

PHEENIX



Why should anyone write a fast - moving machine - code version of an arcade classic, then make you wait 20 seconds between each and every game while the screen fills with stars? It's a pity because this is otherwise an enjoyable version of Phoenix . . . go on, admit it, you'd never have guessed.

You can use the keyboard or either Kempston or AGF joysticks, and select from five skill levels.

There are several screens of birds and eggs to be scrambled before you get to assault the Flagship. The hardest level is suicidal, but a few instructions wouldn't have gone amiss.

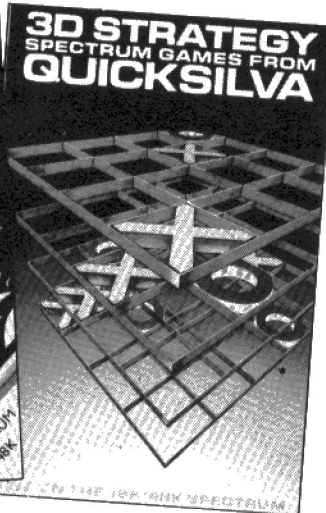
It is colourful, but due to the frustrating wait between each screen change I recommend you look for a better alternative.

AQUARIUS



Bug-Byte bites again with a game that would grace any arcade. Using Kempston joystick or keyboard, you must negotiate your diver through a scrolling sea filled with sharks, jellyfish, mines, strangleweed and other fishy nasties. Most of these can be despatched with a direct shot from your gun, but your oxygen is also expiring, so pick up the supplies from the seabed when you can.

If you're lucky, or extremely skilful, you'll eventually come to dark caverns, at the end of which is your mission — to defuse the death machines by shooting the three-colour coded panels in the sequence given at the start of the game.



Amusing graphics, if a little jerky here and there, but definitely the pick of this batch.

ANT ATTACK



After a hard day's gardening you fall asleep, but your dream turns nasty as the ants decide to get their own back on you. At least that's the story behind what's claimed to be the first Spectrum game controlled partly by your voice.

Yell 'fire' at your tape recorder and that's what's meant to happen. I couldn't make it work, but that's not to say it won't on other tape recorders. More of a gimmick than of practical use, unless you can shout at a very fast rate indeed. Settling for keyboard control, I enjoyed a fast and furious Centipede-type game, shooting at ants and other pests as they descend the screen in that well-known fashion.

The cassette insert is cheaply done, but there's nothing wrong with the game itself.

ALIEN INSECTS



Armed with a laser bolt, you must shoot down the fat little insects that are buzzing all over the screen. You can move in four directions, with a sensible layout for keyboard control.

This is a game worth getting

just to see what sounds can be squeezed out of the Spectrum.

If you kill enough nasties then space eggs start to appear at the top of the screen, waiting to descend on you. By this time the insects are about as easy and pleasant to deal with as a swarm of wasps.

3D STRATEGY



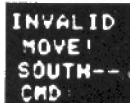
As a change from killing ants, aliens, birds or jellyfish, here's a game where you could cheerfully kill the programmer. It is so hard to beat the machine in this 4x4x4 version of Noughts and Crosses or Connect Four, and I was only playing on the easiest of the four skill levels.

The only drawback to this piece of software is the instructions. They drivel on for pages about how totally wonderful the game is . . . auto-play option, timer that can be set per move, per game or switched off, on-screen ticking clocks, two styles of play, an average response time of 1.7 seconds, machine code, over 200,000 decisions per move, and so on.

The board is displayed as four separate grids at the bottom of the screen, which is a little confusing, though I've no doubt a proper three-dimensional cube would have been even more so.

However, it does offer a very tough opponent, and it may be as good as it claims.

YOMP



A paratrooper opera which is fairly easy to figure out. You use four keys to manoeuvre your way through four columns of trucks and tanks and all you have to do is learn how to place yourself in the optimum position to sneak through to the other side of the moving convoys.

As a video game memento of the Falklands conflict it's a pretty weak effort.

SHEEPWALK



Sheepwalk is almost as dull as Yomp once it's in play. You're a sheepdog moving around the screen trying to catch up with miscreant sheep. While doing this you risk trampling the vegetables or bumping into walls.

GOLF



In its Virgin form, Golf is an interesting enough game to play. It requires players to plot out each shot's direction and strength, while using the right club.

There's enough of a random element to make the game more than a little irritating. When your ball lands in the rough it can take three or four strokes to get it out. This is where having a low handicap (you can choose between 1 and 28) is a real advantage. The game's designers have assumed real duffers are going to have problems in getting out of the woods.

Phoenix (£5.50) — Megadodo Software, 16 White Road, Sutton Coldfield, West Midlands B72 1ND **Aquarius** (£5.95) — Bug-Byte, Mulberry House, Canning Place, Liverpool L1 8JB **Ant Attack**, **Alien Insects** — Macronics Systems, 26 Spiers Close, Knowle, Solihull, West Midlands B93 9ES **3D Strategy** (£6.95) — Quicksilver, 13 Palmerston Road, Southampton **Yomp** (£7.98), **Sheepwalk** (£7.98), **Golf** (£7.98) — Virgin Games, 61-63 Portabello Road, London W11 3DD.

DANGER ZONES

COMMODORE 64 Bolts from the blue

Name Matrix System **Commodore 64** **Price** £8.50 **Publisher** Llamasoft, 49 Mount Pleasant, Tadley, Hants RG26 6BN **Format** Cassette **Language** Machine code **Other versions** Vic-20 **Outlets** Various dealers

If you thought Gridrunner was tough, Matrix, its successor, will make your hair curl. The screen teems with life and movement, and players run the risk of acquiring Gridders' Syndrome — cross-eyes, dislocated wrist and a king-sized inferiority complex.

Objectives

Flying your good ship *Gridrunner* around the grid, your task is to wipe out the invading Droids and Cosmic Cameloids. Your ship can move in any direction and can fly anywhere on the grid, barring the top four lines.

There is a nasty little character called the Snitch to add to your miseries, as well as X and Y zappers which fire across and up the screen.

In play

The graphics and sound effects are excellent, the action as fast as you'll find without being near impossible. The title page allows you to choose your starting zone (1-6). Zones 1 and 2 have respectively one and two droids (caterpillar-like aliens) zooming across the grid. If hit, they split at the point of impact

and race off in opposite directions. Any droids reaching the bottom of the grid will start bouncing around like demented bees trapped in an empty jam-jar.

Zone 3 increases the tempo by sending in three droids and introduces the Snitch, a sort of boy scout gone bad. This tiny, unpleasant humanoid scuttles along the top of the grid, trying to win his Pathfinder badge by tracking your movements.

Zone 4 adds miniature camels (the author must have been bitten by one as a baby!) to the fleet. Zone 5 brings on the Deflexor, a large, centrally-placed shield which changes shape each time its hit. Beware ricochets! Zone 6 has the aliens getting serious by dropping bombs.

Thereafter, the action gets wilder and your eyes wider. The aliens start attacking in a variety of combinations, formations and movements.

There were a couple of mistakes on the cassette insert I had. To select the level, press F1 (not 'any key') and to freeze and unfreeze the action, press the Commodore logo key and any key respectively.

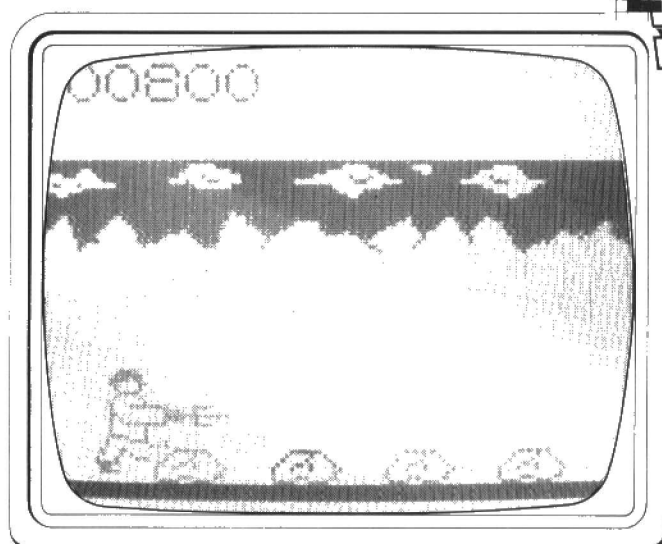
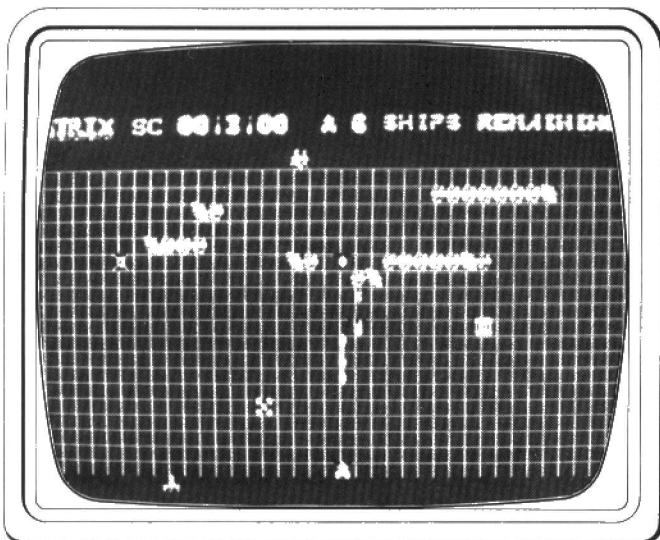
Verdict

Matrix is a high-quality all-action arcade game. It has originality and variety, combined with stunning speed, good graphics, sound and colour. Highly recommended.

Bob Chappell

RATING

Lasting appeal	★★★★
Playability	★★★★
Use of machine	★★★★
Overall value	★★★★



DRAGON 32 Great balls of fire

Name Ninja Warrior System **Dragon 32** **Price** £8.95 **Publisher** Programmers Guild (UK) Ltd, Ahead House, Sandbeds Industrial Estate, Ossett, W Yorks, (0924) 278181 **Format** Cassette **Language** Machine code **Other versions** Tandy Colour Computer **Outlets** Mail order

Ninja Warrior might sound like an adventure game, but it's a graphics challenge that involves moving your man across a scrolling landscape while he kicks rocks and jumps over other assorted items.

Objectives

Points are what you're after as you travel as far as possible through several screens demanding increasingly difficult manoeuvres. Success at the first screen makes you a white belt, the second one a yellow belt, and so on.

In play

Your first choice is between keyboard or joystick control, the keyboard using 'K' for jump and 'O' for Kick. The joystick fire button causes your warrior to jump in Donkey Kong fashion, and moving the stick forward makes him kick out at whatever's in his way. You state the number of players, from one to six.

Judging by the graphics, if I didn't know the program was in machine code I would have put money on it being a Basic program — the movements were rather jerky in places and

the animation of a fairly simple matchstick standard.

The first stage offers you a series of rocks to kick. You can jump as well, but it's possible to leap only a single rock and here they're mostly in groups of three or four.

Become a white belt and you move to yellow-belt level, which involves more rocks, but now with occasional gaps in the ground and fireballs too to leap over. This is where the game gets tricky, with rocks and fireballs placed so close together at times that it seemed impossible to deal with them, though maybe I lack agility.

I did get through eventually, and moved on to second-level yellow belt. Subsequent stages obviously add more hazards for you to deal with... falling fireballs and arrows, to either kick or catch.

One nuisance is having to go right back to the beginning every time you fail, though thankfully not each time you lose one of your three lives, with bonus lives coming at 10,000 points.

The sound effects are the best part of the program, beginning with a door creaking open as the title page shimmers onto the screen, and a rather effective rock-smashing explosion.

Verdict

A disappointing game, and hardly recommended. 'A totally awesome experience in arcade action'? Perhaps a few years ago, yes — but have you visited the arcades lately, Programmers Guild? **Mike Gerrard**

RATING

Lasting appeal	★★
Playability	★★★
Use of machine	★★★
Overall value	★★

STRATEGY

ORIC

The spoils of oil

Name Dallas **System** 48K Oric **Price** £6 **Publisher** Cases Computer Simulations, 14 Langton Way, London SE3 7TL 01-858 0763 **Format** Cassette **Other versions** Spectrum **Outlets** Mail order, Oric dealers.

Even the most dedicated Dallas fan is not likely to stay glued to the TV set when his or her Oric is screening this version of the programme. The menace of JR is somehow lost when all you get is the odd typed mention of him.

Objectives

The object of each episode is to make enough money drilling oil to be able to fight off Euing (or at least that's the way the game spells it) Associates and eventually take it over.

Money is made by investing in oil wells and then developing them.

In play

In the best tradition of the TV soap opera, this is largely a rehash of an old theme, with just a dash of something new. The old theme is that of the 'Kingdom' game; you have to manage resources wisely — don't go too mad and don't be too miserly.

A touch of new is a map showing little graphics which indicate the current state of each oil well.

They start as empty plots of land and are developed into wells, refineries and finally pipelines. All the time their production value is rising, unless of course God or the government should choose to interfere.

Most of the game is spent keying-in two letters (although the program insists on calling them numbers) which give the co-ordinates of each well on the map. These say which well is to be moved/drilled/developed/piped.

The cost of doing each of these is subtracted from the company balance sheet shown on the right hand side of the screen. Profits are added to it.

If the finances are handled badly or lots of dry wells are dug, good old JR sends a Telex saying he is taking over your company.

If you do well you get to send him one.

Verdict

Gone is the double dealing and corruption we used to know in Dallas.

I pressed a few odd keys to see what they do. Some land you back in the middle of a huge Basic program, others muck up the screen display, a few cost money and sometimes you even get to cheat.

The viewing figures for this version of the TV series are likely to plummet after the first few episodes.

Margaret Keenan

RATING

Lasting appeal
Playability
Use of machine
Value for money



IBM PC

War and PCs

Name Call to Arms **System** IBM PC, 64K and one disk drive, colour graphics card **Price** £24.78 **Publisher** Sirius Software, Sacramento, California **Format** Diskette **Outlets** Softsel, Central Way, N Feltham Trading Estate, Feltham, Middlesex, 01-844 2040.

So you thought IBM was taking over the world? Well, Call to Arms provides a new variation on this — you get to take over the world with your IBM. Well, not the whole world, you understand — just Europe. Or even Scotland, if you prefer. Either way, this is a game where you can let your delusions of grandeur run riot.

Objectives

This game is Risk, as near as makes very little difference. Up to four may play, and of them, up to four can be the IBM — so you can just sit back and watch it battle it out, if you prefer. The playing board is either a map of Europe in 1942, or of the countries of Scotland in the eighteenth century — do we spot an expatriate Scottish programmer lurking in Sirius Software's California HQ?

As in the board game, countries are shared out among the players at the outset. There are 36 of them, so everyone gets fair shares. Then you decide how many armies are to be placed in each country for kick-off — anything between two and nine apiece. After thus setting the scene, play begins, and each

player in turn reinforces the countries he or she — or it, in the IBM's case — controls, or attacks neighbouring states.

The winner of each battle is decided randomly, until the attacker decides discretion is the better part of valour or until one force is wiped out. Then the victor must occupy the defeated country with one or more armies, and has the option of doing it all over again, on some other front.

In play

Despite the fact that the IBM has the advantage, since it decides the outcome of each battle, it does play fair. Twice in my first game it made the sad mistake of pitting 13 armies against my three and losing.

Playing this game is none too easy, since to pick the country you want to reinforce, attack or attack from you must move the cursor onto that country. But doing so takes half an eternity, since all four cursor control keys simply step you through the same sequence of countries in the same order. Each time you conquer a country, the map is redrawn in your colours rather slowly. You just have to sit and wait it out.

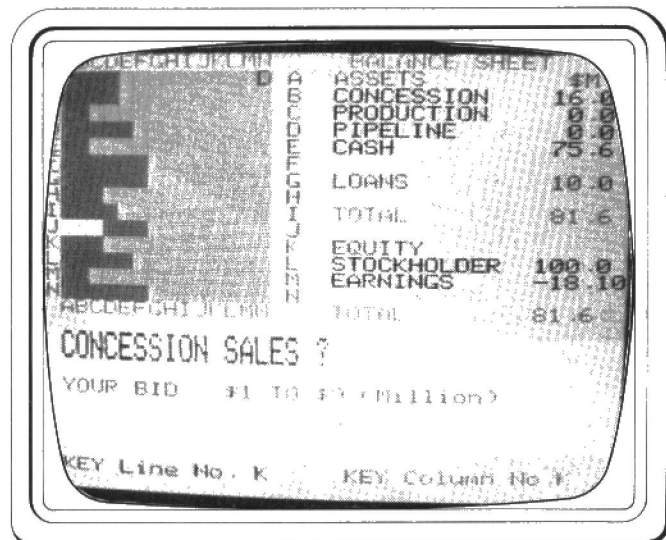
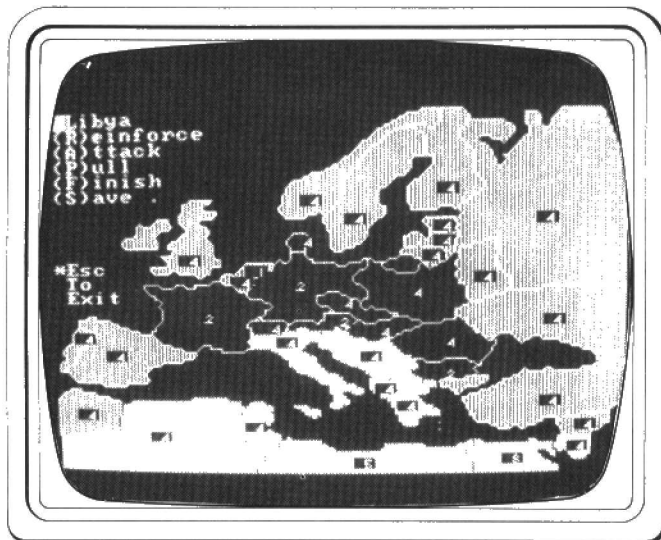
Verdict

There's a certain 'War Games' fascination in watching Europe — or Scotland — change colour before your very eyes. And the game is well implemented, though the instructions could be clearer. If you like — and win at — Risk, you'll like this too.

Shirley Fawcett

RATING

Lasting appeal
Playability
Use of machine
Value for money



PCN ProgramCards

This week in Programcards there are three new programs and the conclusion of the Atlas program for the Lynx 48K.

The Spectrum program will be useful to anyone studying statistics. This bar chart routine from David J Leart, of Washington, Tyne and Wear, displays statistical data in a very clear way. Be careful, when using this program, that the frequencies entered are not too varied. If the difference between the first frequency and the last frequency is too great then the smallest will not be displayed properly.

Many keysetting programs have been published for the BBC, and by now most users will have their own favourite settings.

However, the Keyset program from Alistair McLeod, of Glasgow, displays, on the bottom line of the mode 7 screen, the function of each key. This program has an advantage over the old method of sliding a new function key label under the perspex panel. It can be saved and loaded with the appropriate program.

They key settings that come with the

program are set up for program editing and tape disk copying. Obviously, you can alter the keys to suit your own requirements. Note that the keys and their settings can be loaded and saved by using

*SAVE CEYS BOO CFF BOO
*LOAD CEYS BOO

Asteroid Lander is a version of the famous lunar lander game, for the Dragon 32, from R Woodward Clarke, of Sutton Coldfield. This version is a little more advanced than most as it uses the Dragon's colours and sound rather well. It also holds the name and number of points of the highest scoring player.

In theory it is possible to make the game run even faster by using the speed-up poke: 1870 POKE &HFFD7,0

Unfortunately this caused our machine to crash. The normal speed pokes (&HFFD6,0) were left in so try it and see.

The pilot has the option of keyboard or joystick for control. The keyboard uses the cursor control keys ←, → and ↓. The down arrow is used for thrust. When changing

between arrows release the arrow you were pressing before pressing the next otherwise the last command is repeated.

A RUN for our money

We pay for published programs on a sliding scale which take into account length, complexity, originality and the programming skill demonstrated in the program. So why not give us a RUN for our money?

As well as the cash, you receive the satisfaction of seeing your byline on the ProgramCard — which will, of course, be snipped out and filed away in the libraries of thousands of micro enthusiasts throughout the country.

Send your contribution, on disk or cassette, together with a plain paper listing and brief summary notes to:

The Programs Editor, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

All disks and cassettes will be returned as soon as possible after evaluation or publication, at our expense.

PCN ProgramCards

Asteroid Lander Card 1 of 7

8326AL1/7

```
40 CLEAR 1000
60 CLS 0
130 PRINT@483,"press":PRINT@489,"any":
PRINT@495,"key":PRINT@497,"for":PRINT@
501,"the":PRINT@505,"game":
140 POKE1452,45
150 POKE1493,49:POKE1494,57:POKE1495,56:
POKE1496,51
160 POKE1506,40:POKE1533,41
170 SCREEN 0,1
180 IF INKEY="" THEN 180
190 REM INSTRUCTIONS INPUT PAGE
200 CLS
205 PRINT"JOYSTICK (Y/N) ":INPUT IN#
206 IF IN#="N" THEN JCH=1 ELSE JCH=0
210 PRINT@229,"INSTRUCTIONS (Y/N) ":INPUT
I IN#
220 IF IN#="Y" OR IN#="YES" OR IN#="N" O
R IN#="NO" THEN 230 ELSE 200
230 IF IN#="Y" OR IN#="YES" THEN 250 EL
E 800
240 REM PAGES OF INSTRUCTIONS
250 CLS
260 SOUND240,1
270 PRINT@67,"***theaim*of*the*game***"
280 PRINT@161,"IS TO SAFELY LAND YOUR R
OCKET ON THE LANDING PAD AS MANY
TIMES AS YOU CAN IN THE
EST TIME YOU CAN"
290 PRINT@346,"***PRESS ANY KEY FOR MORE
***"
300 IF INKEY="" THEN 300
310 CLS
```

Dragon 32 Dragon Basic

Application: Game
Author: R Woodward Clarke

```
320 SOUND240,1
330 PRINT@73,"***details***"
340 PRINT@168,"YOU HAVE 3 LIVES.
YOU SET THE INITIAL SPEED AND TH
E AMOUNT BY WHICH THE SPEED IS INCR
EASED AFTER EACH SUCCESSFUL LAND
ING"
350 PRINT@418,"***PRESS ANY KEY FOR MORE
***"
360 IF INKEY="" THEN 360
370 CLS
380 SOUND240,1
390 PRINT@72,"***controls***"
400 PRINT@161,"YOU STEER YOUR ROCKET WIT
H THE RIGHT AND LEFT CURSOR
CONTROLS AND ACTIVATE THE RET
RO ROCKETS WITH THE CURSOR DOWN KEY
"
410 PRINT@386,"***PRESS ANY KEY FOR MORE
***"
420 IF INKEY="" THEN 420
430 CLS
440 SOUND240,1
450 PRINT@66,"***control*of*retro*rocket
***"
520 PRINT@163,"WHILE YOUR FIRE BUTTON IS
DEPRESSED YOUR VELOCITY IS S
LOWLY DECREASED UNTIL IT IS ZERO.R
LEASE THE BUTTON TO CH THE RETROS
AND RESUME MAXIMUM VELOCITY"
530 PRINT@450,"***PRESS ANY KEY FOR MORE
***"
540 IF INKEY="" THEN 540
```

40 Reserve 1,000 bytes for
variables etc.
60 Clearscreen

130-230
240-540

Option of joystick and
instructions
Instructions (may be omitted if
desired)

Asteroid Lander Card 2 of 7

8326AL2/7

```
670 CLS
680 SOUND240,1
690 PRINT@73,"***scoring***"
700 PRINT@164,"A HIGH SCORE FACILITY IS
    INCLUDED.THE HIGH SCORE SCREEN IS D
    ISPLAYED BEFORE A NEW GAME. TO MOVE ON T
    O A NEW GAME PRESS ANY KEY"
710 PRINT@418,"***PRESS ANY KEY FOR MORE
    ***"
720 IF INKEY$="" THEN 720
730 CLS
740 SOUND240,1
750 PRINT@70,"***screen*display***"
760 PRINT@164,"AT THE BOTTOM IS THE PAD
    ON THE ICE COVERED ASTEROID. AT
    THE TOP IS THE ROCKET, THE NUMBER
    OF LIVES LEFT & THE MAXIMUM & PRESEN
    T VELOCITY"
770 PRINT@418,"***PRESS ANY KEY TO START
    ***"
780 IF INKEY$="" THEN 780
790 REM GOOD LUCK PAGE
800 CL=RND(9)-1
810 PLAY"01"
820 FOR J=462 TO 1 STEP-33
830 CLS CL
840 PRINT@J,"GOOD LUCK!!!!..."
850 SCREEN 0,1
860 PL=PL+5
```

```
870 IF PL>12 THEN PLAY"0+"
880 IF PL>12 THEN PL=1
890 PLAY"15;V20;" +STR$(PL)
900 NEXT J
910 FOR J=1 TO 400:NEXT J
920 REM SETTING UP VARIABLES
930 HS=1000
940 HS$="THE COMPUTER"
950 DIM R (9,15)
960 DIM NR (9,21)
970 DIM RR (9,7)
980 DIM PAD (16,21)
990 A$="BM+2,+0;U5E2F2D2L4R4D3"
1000 C$="BM+2,+0;H1U5E1R2F1BD5G1L2BR3"
1010 D$="BM+2,+0;R1U7L1R3F1D5G1L2BR3"
1020 E$="BM+6,+0;L4U4R3L3U3R4BD7"
1030 H$="BM+2,+0;U7D3R4U3D7"
1040 I$="BM+2,+0;R2L1U7L1R2BD7"
1050 L$="BM+2,+0;U7D7R4"
1060 N$="BM+2,0;U7D1F4U5D7"
1070 O$="BM+2,+0;U7R4D7L4R4"
1080 P$="U7R3F1D2G1L3BR4BD3"
1090 R$="BM+2,+0;U7R3F1D2G1L3R2F1D1F1"
1100 S$="BM+2,-1;F1R2E1U2H1L2H1U1E1R2F1B
    D6"
1110 T$="BM+4,+0;U7L2R4BD7"
1120 V$="BM+3,-7;D5F2E2U5BD7"
1130 Y$="BM+2,-7;D2F2D3U3E2U2BD7"
1140 L1$="BM+0,-4;E1R1D5L2R4"
```

670-780
790-910

Continue instructions
Game start with a 'good luck'
message

920-1140

Setup variables and
graphics strings

Asteroid Lander Card 3 of 7

8326AL3/7

```
1150 L2$="BM+0,-4;E1R3F1D1G1L3G1D1R5"
1160 L3$="BM+0,-4;E1R3F1G1L1R1F1D1G1L3H1
    "
1170 B=0
1180 TI=0
1280 REM INPUT SPEED SETTINGS PAGE
1290 IF SK=2 THEN SOUND 150,3 ELSE SOUND
    50,3
1300 CLS
1310 PRINT@133,"SELECT SPEED 1-20";:INPU
    T S
1320 IF S<1 OR S>20 THEN 1300
1330 SOUND S*12,2
1340 PRINT@289,"SELECT SPEED INCREASE 1-
    10";:INPUT V
1350 IF V<1 OR V>10 THEN 1300
1360 SOUND V*12,2
1370 FOR J=1 TO 500:NEXT J
1380 REM PLEASE WAIT PAGE
1390 CLS RND(9)-1
1400 PRINT@232,"**please*wait**";
1410 PRINT@200,"*****";
1420 PRINT@264,"*****";
1430 SCREEN 0,1
1440 REM SKIP FORWARD IF ALREADY DEFINED
1450 IF NN=1 THEN 1610
1460 REM DEFINE ROCKET ETC.
1470 PMODE 4:PCLS
1480 DRAW"S4;BM2,14;U1E2F2D1U1H2U1R2U7F2
```

```
D3L2U6H2G2D6L2U3E2D7R2"
1490 GET(0,0)-(8,14),R,G
1500 PCLS
1510 DRAW"S4;C5;BM0,6;E2;U2;BM8,6;H2;U2;
    BM4,0;D5;F1;H1;G1"
1520 GET(0,0)-(8,6),RR,G
1530 PCLS
1540 GET(0,0)-(8,20),NR,G
1550 PCLS
1560 DRAW"BM0,0;R20D1L5D2L1R2L1U2L15R5D2
    R1L2D1L4D11R20U11L15"
1570 DRAW"S4;BM2,13;" +P$+A$+D$
1580 GET(0,0)-(20,15),PAD,G
1590 NN=1
1600 REM SET UP SCREEN & SCREEN VARIABLE
    S
1610 THR=0
1620 IF LIVES=0 THEN LIVES=3
1630 X=RND(241)+4;Y=15
1640 PMODE4,1:PCLS
1650 FOR ST=1 TO 100
1660 PSET(RND(253)+1,RND(170)+15,5)
1670 NEXT ST
1680 CIRCLE(RND(50)+100,191),200,5,.12,
    .5,0
1690 PAINT(125,190),5,5
1700 PP=RND(232)+1
1710 IF PP>105 AND PP<130 THEN 1700
1720 PUT(PP,161)-(PP+20,176),PAD,PSET
```

1150-1180
1280-1370
1380-1420

More strings and variables
Select speed settings. The
lower numbers are easier
Display "wait" message while

1460-1590
1600-1720

graphics are defined
Proceed with the definitions, if
required
Start of screen set-up

Euro Atlas
Card 3 of 6

Lynx/Lynx Basic/Wood/Continued

8326EA3/6

```

1110 DATA 86,138,74,134,68,138,68,147
1120 DATA 55,150,46,142,20,136,26,126
1130 DATA 30,98,22,90,24,84,2,74
1140 DATA 4,72,4,68,0,70,2,66
1150 DATA 8,66,12,64,16,64,18,68
1160 DATA 28,66,28,60,26,54,32,54
1170 DATA 34,57,45,56,43,54,56,47
1180 DATA 55,38,63,35,77,48,110,60
1190 DATA 103,82,94,99,100,95,103,112
1200 DATA 98,114,103,116,102,123,108,126
1210 VDU 1,2
1220 PRINT @ 0,210;"Do you require more
information? Y/N "
1230 IF GETN=78 THEN GOTO 1400
1240 VDU 1,2
1250 FOR V=1 TO 8
1260 READ U,I
1270 MOVE U,I
1280 DRAW 120,10+(V*10)
1281 BEEP 200,10,65000
1285 NEXT V
1290 DATA 44,55,50,57,62,64,26,84
1300 DATA 33,116,84,84,52,135,88,137
1320 WINDOW 61,123,16,245
1330 VDU 23,1,1
1340 FOR N=1 TO 8
1350 READ N#
1360 PRINT N#
1370 NEXT N
1380 DATA 1.LE HAVRE,2.ROUEN,3.PARIS,4.NANTES
    
```

```

1390 DATA 5.BORDEAUX,6.DIJON,7.TOULOUSE,
8.MARSEILLES
1395 VDU 1,2
1400 PRINT @ 0,210;"Do you require anot
her country? Y/N"
1410 IF GETN=78 THEN GOTO 10000
1420 GOTO 50
2000 CLS
2010 VDU 1,2
2020 PRINT @ 61,0;"SPAIN & PORTUGAL"
2030 PRINT @ 61,10;"-----"
2040 VDU 1,4
2050 MOVE 12,76
2060 RESTORE 2090
2070 FOR Z=1 TO 71
2080 READ A,B
2090 DRAW A,B
2100 BEEP 400,10,65000
2110 NEXT Z
2120 DATA 18,74,18,76,16,78,25,79
2130 DATA 27,77,31,78,32,81,34,82
2140 DATA 28,88,28,94,25,95,25,97
2150 DATA 27,98,26,102,22,103,25,109
2160 DATA 24,113,23,111,22,115,25,117
2170 DATA 25,120,20,123,20,128,7,130
2180 DATA 10,114,6,114,7,111,4,112
2190 DATA 5,104,8,103,13,85,12,74
2200 DATA 15,73,11,63,18,60,20,61
    
```

1110-1420 Same as Great Britain but for France

2000-2530 Spain and Portugal

Euro Atlas
Card 4 of 6

8326EA4/6

```

2210 DATA 19,58,25,56,26,59,60,63
2220 DATA 62,62,65,64,70,63,73,63
2230 DATA 73,65,87,69,89,66,94,68
2240 DATA 95,72,108,71,108,77,102,83
2250 DATA 93,86,90,90,92,91,89,95
2260 DATA 88,93,82,105,86,113,80,117
2270 DATA 78,126,69,128,66,135,47,135
2280 DATA 44,138,40,136,37,141,34,143
2290 DATA 31,141,24,129,20,128
2291 MOVE 103,103
2292 FOR D=1 TO 4
2293 READ A,B
2294 DRAW A,B
2295 BEEP 400,10,65000
2296 NEXT D
2297 DATA 109,99,113,101,110,105,103,103
2300 VDU 1,2
2310 PRINT @ 0,210;"Do you require more
information? Y/N "
2320 IF GETN=78 THEN GOTO 2510
2330 FOR V=1 TO 10
2340 READ U,I
2350 MOVE U,I
2360 DRAW 120,10+(V*10)
2370 BEEP 200,10,65000
2380 NEXT V
2390 DATA 11,63,60,63,15,85,7,111,53,95
2400 DATA 102,83,32,127,82,105,114,102,3
7,141
2410 WINDOW 61,123,16,245
2420 VDU 23,1,1
    
```

```

2430 RESTORE 2480
2440 FOR N=1 TO 10
2450 READ N#
2460 PRINT N#
2470 NEXT N
2480 DATA 1.CORUNNA,2.BILBAO,3.OPORTO(Po
rtugal)
2490 DATA 4.LISBON(Portugal),5.MADRID,6.
BARCELONA
2500 DATA 7.SEVILLE,8.VALENCIA,9.MAJORCA
,10.GIBRALTAR
2505 VDU 1,2
2510 PRINT @ 0,210;"Do you require anot
her country? Y/N"
2520 IF GETN=78 THEN GOTO 10000
2530 GOTO 50
3000 VDU 1,2
3010 CLS
3020 PRINT @ 61,0;"E.&W.GERMANY&DENMARK"
"
3030 PRINT @ 61,10;"-----"
"
3040 VDU 1,4
3050 MOVE 80,160
3055 RESTORE 3110
3060 FOR Z=1 TO 79
3070 READ A,B
3080 DRAW A,B
3090 BEEP 400,10,65000
3100 NEXT Z
    
```

3000-3550 East & West Germany and Denmark

Euro Atlas

Card 5 of 6

8326EA5/6

```

3110 DATA 112,145,117,149,113,88,95,72
3120 DATA 68,81,63,92,75,101,68,102
3130 DATA 70,120,63,120,63,126,68,126
3140 DATA 52,136,59,159,80,160,102,192
3150 DATA 102,197,97,195,95,201,87,205
3160 DATA 90,220,85,214,63,219,59,216
3170 DATA 53,216,52,220,28,209,25,213
3180 DATA 12,212,24,183,5,177,0,137
3190 DATA 3,120,13,120,22,83,32,82
3200 DATA 33,90,40,87,39,83,40,80
3210 DATA 44,81,44,47,39,43,41,32
3220 DATA 41,20,49,11,56,11,70,0
3230 DATA 60,23,72,26,71,32,56,46
3240 DATA 66,42,68,46,66,48,71,49
3250 DATA 71,62,73,59,86,60,75,51
3260 DATA 73,41,90,36,92,45,87,49
3270 DATA 90,52,85,54,90,59,86,60
3280 DATA 82,67,67,63,71,55,62,56
3290 DATA 56,46,56,62,44,58,56,62
3300 DATA 58,65,72,73,68,81
3310 VDU 1,2
3320 PRINT @ 0,230;"Do you require more
      information? Y/N"
3330 IF GETN=78 THEN GOTO 3520
3335 RESTORE 3400
3340 FOR V=1 TO 10
3350   READ U,I
3360   MOVE U,I
3370   DRAW 120,10+(V*10)
3380   BEEP 200,10,65000
3390 NEXT V
3400 DATA 56,30,92,45,58,88,11,133,12,14
      1
3410 DATA 35,160,39,188,100,111,71,202,1
      02,143
3420 WINDOW 61,126,16,245
3430 VDU 1,1,23
3440 RESTORE 3490
3450 FOR N=1 TO 10
3460   READ N#
3470   PRINT N#
3480 NEXT N
3490 DATA 1. JUTLAND (D), 2. COPENHAGEN (D), 3
      . HAMBURG (W.G), 4. DUSSELDORF (W.G)
3500 DATA 5. COLOGNE (W.G), 6. FRANKFURT (W.G
      ), 7. STUTTGART (W.G), 8. BERLIN (E.G)
3510 DATA 9. MUNICH (W.G), 10. DRESDEN (E.G)
3520 VDU 1,2
3530 PRINT @ 0,230;"Do you require anot
      her country? Y/N"
3540 IF GETN=78 THEN GOTO 10000
3550 GOTO 50
4000 VDU 1,2
4010 CLS
4020 PRINT @ 61,0;"SWITZERLAND&AUSTRIA"
4030 PRINT @ 61,10;"-----"
      "
4040 VDU 1,4
4050 RESTORE 4120
4060 MOVE 47,101

```

4000-4540 Switzerland and Austria

Euro Atlas

Card 6 of 6

8326EA6/6

```

4070 FOR Z=1 TO 69
4080   READ A,B
4090   DRAW A,B
4100   BEEP 400,10,65000
4110 NEXT Z
4120 DATA 46,106,44,104,42,104,43,110
4130 DATA 41,110,41,107,37,108,35,105
4140 DATA 34,100,32,111,31,113,31,114
4150 DATA 27,107,28,105,24,106,22,111
4160 DATA 13,111,11,104,5,107,5,100
4170 DATA 17,92,14,90,16,88,19,90
4180 DATA 29,89,29,86,32,86,32,88
4190 DATA 40,91,42,90,44,93,47,93
4200 DATA 48,91,51,91,52,93,55,94
4210 DATA 63,89,69,90,72,93,70,84
4220 DATA 76,81,76,78,78,80,80,75
4230 DATA 85,79,91,72,107,76,109,90
4240 DATA 107,90,107,86,103,90,106,92
4250 DATA 101,102,104,108,98,104,89,106
4260 DATA 88,109,84,109,65,104,62,99
4270 DATA 53,100,53,102,50,103,49,100
4280 DATA 47,100,46,98,43,100,39,96
4290 DATA 40,91
4300 VDU 1,2
4310 PRINT @ 0,210;"Do you require more
      information? Y/N"
4320 IF GETN=78 THEN GOTO 4520
4330 RESTORE 4400
4340 FOR V=1 TO 8
4350   READ U,I
4360   MOVE U,I
4370   DRAW 120,10+(V*10)
4380   BEEP 200,10,65000
4390 NEXT V
4400 DATA 20,90,18,97,5,107,29,93
4410 DATA 56,96,83,82,103,84,93,100
4420 WINDOW 61,123,16,245
4430 VDU 23,1,1
4440 RESTORE 4490
4450 FOR N=1 TO 8
4460   READ N#
4470   PRINT N#
4480 NEXT N
4490 DATA 1. BASLE (SW), 2. BERNE (SW), 3. GENE
      VA (SW), 4. ZURICH (SW)
4500 DATA 5. INNSBRUCK, 6. LINZ, 7. VIENNA, 8.
      GRAZ
4510 VDU 1,2
4520 PRINT @ 0,210;"Do you require anot
      her country? Y/N"
4530 IF GETN=78 THEN GOTO 10000
4540 GOTO 50
10000 BEEP 500,500,63
10010 WINDOW 3,123,5,245
10015 CLS
10020 VDU 24
10030 PRINT @ 60,60;"THE END"
10040 VDU 25

```

10000-10040 Endsequence

Bar Chart

8326BC1/2

Card 1 of 2

A useful program for statisticians

```

10 PRINT AT 0,10;"INSTRUCTIONS";AT 1,1
0;"-----"
11 PRINT AT 5,5;"The user first enters
the""number of classes for which a""b
ar is to be drawn."" For each clas
s the name and frequency are then input a
s""prompted."
12 PRINT AT 18,6;"Press any key to beg
in"
13 PAUSE 5000
14 CLS
100 DIM F(14)
110 DIM H(14)
120 DIM L(14)
150 INPUT "ENTER NUMBER OF CLASSES (MAX
10) ";NC
151 IF NC>10 OR NC<=0 THEN GO TO 150
152 IF NC<4 THEN LET err=0
153 IF NC>=4 THEN LET err=1
170 LET NP=INT ((215-(8*NC))/NC)
180 LET MC=INT (27/NC)
185 DIM N$(NC,MC-1)
190 LET MAX=0
195 LET MIN=9999
200 FOR C=1 TO NC

```

Spectrum
Spectrum BasicApplication: Educational
Author: David Leart

```

205 CLS
210 PRINT "ENTER NAME (MAX ";MC-1;" C
HARAS) AND""FREQUENCY (MAX 4 DIGITS) "
215 INPUT N$(C);" ";F(C)
217 IF LEN STR$ F(C)>4 THEN CLS : PR
INT "NAME MAX ";MC-1;" CHARAS :""FREQUE
NCY MAX 4 DIGITS :"" RE-INPUT LAST SET
OF DATA": GO TO 215
220 IF F(C)>MAX THEN LET MAX=F(C)
225 IF F(C)<MIN THEN LET MIN=F(C)
230 NEXT C
235 CLS
238 LET lam=LEN STR$ MAX
239 LET len=LEN STR$ (MAX-MIN)
240 LET xx=.05
242 IF MAX<=(.1*(10^lam)) THEN LET zz=
.1
243 IF MAX<=(.25*(10^lam)) AND MAX>(.1*
(10^lam)) THEN LET zz=.25
245 IF MIN<(.1*MAX) THEN LET xx=xx*1
246 IF MAX<=(.5*(10^lam)) AND MAX>(.25*
(10^lam)) THEN LET zz=.5
247 IF MAX>(.5*(10^lam)) THEN LET zz=
1
248 LET inc=(10^lam)*(xx*zz)
249 LET FP=inc/8

```

10-14 Introduction page
100-120 Dimension arrays
150-153 Get and check the number of
classes
170 Work out the width of the bars
180 Evaluate the number of
characters allowed per name

185
190-195
200-230

Dimension the name array
Set up some variables
Get name and frequency for
each class and work out the
maximum and minimum
frequencies for each class

238-249

Calculate the scale for the
frequency axis

Bar Chart

8326BC2/2

Card 2 of 2

```

250 PLOT 32,175: DRAW 0,-167: DRAW 223,
0
260 LET X1=21: LET Y1=0: LET I=0
270 PRINT AT X1,Y1:I
280 FOR V=1 TO 10
290 LET X1=X1-2: LET I=I+inc
300 PRINT AT X1,Y1:(I*2)
310 NEXT V
320 LET X2=21: LET Y2=5
325 FOR P=1 TO NC
330 IF NC=4 AND P=2 THEN LET Y2=Y2+e
rr
332 IF NC=5 AND P=3 OR P=5 THEN LET
Y2=Y2+err
333 IF NC=5 AND P=4 THEN LET Y2=Y2-2
335 IF NC=6 AND P=3 OR P=4 OR P=5 THE
N LET Y2=Y2+err
337 IF NC=6 AND P=4 THEN LET Y2=Y2-2
339 IF NC=7 AND P=2 OR P=4 OR P=6 OR
P=7 THEN LET Y2=Y2+err
340 IF NC=8 AND P=4 OR P=5 THEN LET
Y2=Y2-1
341 IF NC=8 AND P=7 THEN LET Y2=Y2+e
rr
344 IF NC=8 AND P=8 THEN LET Y2=Y2+2
345 IF NC=9 AND P=4 THEN LET Y2=Y2-3
346 IF NC=9 AND P=5 OR P=7 OR P=8 THE
N LET Y2=Y2+err

```

```

347 IF NC=10 AND P<>1 AND P<>5 AND P<
>6 AND P<>10 THEN LET Y2=Y2+err
348 IF NC=10 AND P=4 THEN LET Y2=Y2-
2
349 PRINT AT X2,Y2:N$(P)
350 LET Y2=Y2+MC
355 NEXT P
365 LET X3=40
368 LET ink=INT (RND*4)
370 FOR B=1 TO NC
375 INK ink
380 LET H(B)=(INT (F(B)/FP))-8
390 LET L(B)=H(B)
400 PLOT X3,10+L(B)
410 DRAW NP,0
420 IF B=NC AND NOT L(B) THEN STOP
430 LET L(B)=L(B)-(L(B)>0)+(L(B)<0)
440 IF L(B) THEN GO TO 400
450 LET X3=X3+NP+8
455 LET ink=ink+1: IF ink=4 THEN LET
ink=0
460 NEXT B
465 INK 0
466 INPUT "DO YOU WANT TO RUN PROGRAM"
"AGAIN? (Y/N) ";R$
467 IF R$="Y" THEN CLS : GO TO 150
470 STOP

```

250-310 Plot axes and print the
frequency scale
320-355 Print the names of the classes
368 Randomly select the colour of
the first bar. Note that RND*4
can be changed to RND*7 to
obtain a wider range of colours

370-460
466

Plot the bars
Option to rerun the program

Keyset

8326K1/2

Card 1 of 2

A utility to display the contents of the function keys at the bottom of the screen

```

1000N ERROR NEW:END
110L$=""
120A$=CHR$129+CHR$157+CHR$135
130B$=CHR$129+CHR$157+CHR$151
140C$=CHR$32+"f"
150D$=CHR$32+CHR$32+"f"
160E$=CHR$106+CHR$32
170F$=CHR$32+CHR$53+CHR$32
180L$=L$+A$+C$+"0"+D$+"1"+C$+"2"+D$+"3"
"+C$+"4"+D$+"5"+C$+"6"+D$+"7"+C$+"8"+D$+"9"
190L$=L$+B$+E$+"C"+F$+"L"+E$+"T"+F$+"D"
"+E$+"C"+F$+"M"+E$+"R"+F$+"A"+E$+"R"+F$+"K"
200L$=L$+B$+E$+"L"+F$+"I"+E$+"A"+F$+"I"
"+E$+"A"+F$+"E"+E$+"E"+F$+"U"+E$+"U"+F$+"E"
210L$=L$+B$+E$+"S"+F$+"S"+E$+"P"+F$+"S"
"+E$+"T"+F$+"M"+E$+"N"+F$+"T"+E$+"N"+F$+"Y"
220L$=L$+B$+E$+" "+F$+"T"+E$+"E"+F$+"K"
"+E$+" "+F$+"Y"+E$+" "+F$+"O"+E$+" "+F$+"S"
230$&C00=L$

```

BBC 'B'

BBC Basic

Application: Utility

Author: Alistair McLeod

- 100 Sets error-trapping to clear program from memory (line 450 forces a deliberate error to do just that)
- 110-170 Sets string variables to teletext character display codes and necessary text.
- 180-220 L\$ is now set to hold the display lines in one string. The user may change the actual words printed to suit his/her own function settings.
- 230 This string is now stored at &C00 and therefore will not be affected by BREAK. The user may decide to place it elsewhere if user-defined characters are needed.

Keyset

8326K2/2

Card 2 of 2

```

240*KEY0 WIDTH0:MMODE7:M
250*KEY1 LIST:M
260*KEY2 *TAPE:M
270*KEY3 *DISK:M
280*KEY4 *CAT:M
290*KEY5 MEM$=CHR$13+CHR$11+CHR$11+CHR$11+"MEMORY SPACE LEFT = "+STR$(HIMEM-TO P)+" Bytes"+STRING$(80," "):PRINT MEM$:M
300*KEY6 RENUMBER 100,10:M
310*KEY7 AUTO
320*KEY8 MODE7:MRUN:M
330*KEY9 MODE7:MPRINTTAB(0,20);$&C00;:VDU2B,0,19,39,0:CLS:M
340CLS:VDU 31,0,4
350PRINT CHR$134;" The function key s are now set."
360PRINT CHR$134;" Press KEY 9 to display settings."
370PRINT CHR$134;" Computer will operate normally."
380PRINT CHR$134;" Remember that the following"
390PRINT CHR$134;" control codes are available :-"
400 PRINT TAB(3,10);CHR$131;"Printer :-";CHR$136;CHR$129;CHR$157;CHR$135;"ON ";CHR$156;" ctrl-B"
410 PRINT TAB(16,11);CHR$129;CHR$157;CHR$135;"OFF ";CHR$156;" ctrl-C"
420 PRINT TAB(3,13);CHR$130;"Page mode :-";CHR$136;CHR$132;CHR$157;CHR$135;"ON ";CHR$156;" ctrl-N"
430 PRINT TAB(16,14);CHR$132;CHR$157;CHR$135;"OFF ";CHR$156;" ctrl-O"
440PRINT TAB(3,17);CHR$133;"Clear text window ";CHR$135;" ctrl-L""
450End

```

- 240-330 Definition of function keys. Again the user may wish to change the key definitions in lines 190-220 to suit those in lines 240-330. KEY0 clears the complete screen, including the key display. KEY1-4 are self explanatory. KEY5 displays the remaining memory space left, excluding variables. KEY6 is self-explanatory. KEY7 does not include a CTRL M (carriage return) so that the user can start line-numbering where necessary. KEY8 clears the whole screen and runs the current program. KEY9 displays the function key settings (this is the only one you have to remember).
- 340 Clears the screen and sets the printing position.
- 350-440 Simple coloured text output reminding the user of the handy control functions.
- 450 Lower case End produces a deliberate error to be trapped by line 100 to clear the program memory.

Clubnet keeps you in touch with enthusiasts throughout the country. It is divided into clubs and user groups and a list of each is published on alternate weeks.

This week it is the turn of clubs, which are listed alphabetically by county and town.

Medway modems



Every computer that's had its day need not be consigned to the back of a cupboard forever, as members of the Medway Amateur Computer & Robotics Organisation (MACRO) could tell you. Just one such machine, built years ago by a founder-member, is about to be reinstated in a central position in the club.

It is their S100 system using 8in twin floppies, CP/M-based and dating back just about all the eight years of their existence.

Members have developed text-type games on it and taught themselves Basic programming and machine code development. 'For a while, it has languished,' said club member Mike Hutchins, 'as we tend to have our own systems. Now its going to help provide a club database.'

This is the club's current project and 13

members are at different stages of building their own modems. Paul Cameron, another club member, explained: 'To begin with, we're setting up everyone interested with an acoustic modem. If we have enough, we'll have a small mailbox system here at the club's meeting place.'

The club's long-standing members regret that some people who have recently visited the club may have been put off a second visit because they felt they didn't know enough about electronics to participate fully. But such an impression would be a mistake. Mike Strickland, currently setting up his own modem, claimed never to have seen an integrated circuit board in his life before.

Members at this meeting proved a point. Although a number were engrossed in

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet*, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

Our Clubnet report this week focuses on the Medway Amateur Computer & Robotics Organisation.



Members work on their modems — part of the mailbox project

modems, others were busy elsewhere. Tony Pink and Peter Sells were occupied on a program they are designing. 'I'm in the newspaper world and I'm looking at how we can make use of computers by developing a wholesale newspaper distribution package,' said Tony.

But it's not all hands-on practice. The club also organises talks which recently included a series on Assembly code, and a demonstration by Kent County Library of its international database.

Harriet Arnold

Name Medway Amateur Computer & Robotics Organisation (MACRO) **Venue** Unit 3, Walderslade Centre, Walderslade Road, Chatham, Kent **Meetings** First Tuesday and third Wednesday of each month **Contact** Paul Cameron, 0634 63036.

CLUBS

AVON

Bristol Berkeley Nuclear Laboratories Club. Contact Neil Walker, 53 Wolfridge Ride, Alveston, Bristol, 0454 414262.

Bristol Micro Computer Club. Meets at the Pavilion, Southend Road, Filton, Bristol, every other Tuesday. Darryl Collins, 60 Mackie Rd, Filton, Bristol BS12 7NA, 0272 792982.

Bristol Format 40/80 Disc Club, for BBC disk users. Contact Peter Hughes, Format 40/80 Disc Club, c/o The Lending Library, Five Marshal Street, Bristol BS1 4AA.

Multi-User Club Valerie Boyde-Shaw, Nailsea 851337.

Worle Computer Club. Meets at Woodsprings Inn Functions Rooms on alternate Mondays at 7-10.30pm. H Bennett, 0934 514902 or F Feeney, 0934 833122.

BEDFORDSHIRE

Bedford Amateur Computer Club. Meets at Star Rowing Club, Bedford, on the first and third Tuesday of month 8pm. Rowan Bird, 74 High Street, Great Barford, MK44 3LB, 0234 870763.

Chiltern Computer Club. Meets at Five Bells, Eaton Bray, Near Dunstable, Leighton Buzzard on second and fourth Monday of each month. Contact Steve Betts, 42 Wallace Road, Eaton Bray, 0U6 2DF, 0525 220922.

Luton College Computer Club. John Rodger, 0582 3411.

Luton Computer Club. J P Fletcher, 1 Trowbridge Gardens, Luton, LU2 7JY, 0582 450687.

BERKSHIRE

Easthampstead Computer Club. Meets at Easthampstead Park School, Bracknell, on the first Wednesday in month at 8pm. Brian Poulton, 0344 84423.

BIRMINGHAM

Birmingham Amateur Computer Club. Meets at Free Church Hall, Land Lane, Marston Green, Birmingham on first and third Thursday of each month at 7.30pm. Contact Les Moore, Secretary, Wolverhampton 725340.

BUCKINGHAMSHIRE

Aylesbury Computer Club. Meets at Quarrendon Youth Club every Friday at 7.30pm and at Mandville County Secondary School the first Thursday of each month at 7pm. Ken Knight, 22 Mount Street, Aylesbury, 0296 5181.

Chiltern Microcomputer Club. Meets at the Garden Centre, School Lane, Chalfont St Giles, on the first Wednesday of each month. Mrs W Tibbitts, Ellwood, Deanway, Chalfont St Giles. 024 07 4906.

Iver Computer Club. P A Seal, 1 Ormonde Flats, Church Road, Iver Heath, 0753 652792.

Iver Computer Society meets at Huntsmoor room, Iver Village Hall on the second and fourth Thursday every month at 7.30. John Haigh, 141 Leas Drive, Iver, SL0 9RP.

CAMBRIDGESHIRE

Cambridge Microcomputer Club, meets on the third Wednesday of month. Derek Tripp, 3 Spurgeons Avenue, Waterbeach. 0223 315662.

Peterborough Personal Computer Club meets at Crosfield Electronics Social Club, fortnightly on Mondays. Andrew Pike, 0733 44342 after 5pm.

CHESHIRE

Altrincham Computer Club. Meets at N. Cestrian Grammar School, Durham Road, Altrincham, fortnightly. Martin Hickling, 39 Barrington Road, Altrincham, WA14 1H2, 061 941 4547.

Brunel Computer Club. Meets at St Werburgh Community Centre on alternate Wednesdays at 7 to 10pm. Mr R Simpson, 4 The Coots, Stockwood.

Chester Computer Club. Contact W Collins, 37 Garden Lane, Chester, Cheshire.

Crewe Computer Users Club meets at Buffaloes Club, Earl Street, Crewe, on the third Thursday of each month at 8pm. Bram Knight, 0270 623375.

Holmes Chapel Micro Club meets at Leisure Centre, Holmes Chapel at 7.30 to 9.30pm on the first and third Tuesday of month. Margaret Baker, 1 Helton Close, Crewe. 0477 34238.

Kinder Peak Computer Club meets at Bew Mills School every Monday. John Eary, New Mills 43870.

Kettleshulme National Computer Buyer's Club. Send SAE to Barry Edwards, Laneside House, Paddock Lane, Kettleshulme, nr Stockport, Cheshire.

New Mills & District PCC meets at New Mills School, fortnightly on Fridays at 7 to 9.30pm. Mr G M Flanagan, 11 Sundown Close, New Mills, Stockport, SK12 3DH, 0663 44051.

Northwest Computer Club meets fortnightly. John Lightfoot, 13 Aston Drive, Frodsham, Warrington, WA6 7PU. 0728 31519.

Northwest Computer Club, weekly meetings. Tom Wyatt, 29 Summer Lane,

Halton, Runcorn Cheshire WA7 5PG. Runcorn 77545.

Mid-Cheshire Computer Club meets at Winsford Library on the second Friday every month at 7.30pm. Simon Sadler, Winsford 53339.

Stockport Software Exchange Club. Send SAE to P Redford, 53 Cavendish Road, Hazel Grove, Stockport, Cheshire.

CLEVELAND

Cleveland Micro Club meets on the second and third Tuesday of each month, under 18s on second of month, over 21s on third Tuesday of month. J Telford, 13 Weston Crescent, Norton.

Stockton Amateur Computer Club meets at YMCA, Stockton, each alternate week at 7-9pm. Peter Cheshire, 60 Croft Road, Eaglescliffe, Stockton-on-Tees, TS16 0DY.

CORNWALL

Cornish Radio Amateur Club — Computing Section. Bob Reason, 24 Mitchell Road, Camborne.

Cornwall Area PAICC meets at the Penzance Micro Centre every Friday. S Zenith. Hayle 754845.

St Austell Computer Club and Computer Town meets at ECIP Labs, Penpewar Road, fortnightly on Mondays at 7.30pm. N G Day, 2 Cilendale Close, St Austell.

CUMBRIA

Ambleside Computer Club. Contact Jeremy Westernman, 8 Hill Top Road, Ambleside, Cumbria. Tel: Ambleside 2452.

DERBYSHIRE

Derby Micro Society meets at Littleover Church Hall, Sheperd Street, on every other Thursday at 7pm. Mike Riordan, 0332 769440.

Glossop Computer Club. John Dearn, 2 Spinney Close, Glossop.

DEVON

Brixham Computer Users Club. Meets at Computer Systems (Torbay), Pump Street, Brixham, Saturdays at 2.30pm. Ian Chipperfield, 22 Brookdale Court, Brixham, Devon (Brixham 59224).

Computers Against the Bomb. Contact Paul Couchman, 29 Clifton Place, North Hill, Plymouth, Devon.

Exeter & District Computer Club meets at Exeter School, Magdalene Road, Exeter, on the second and fourth Tuesday every month. T G Holden, 14 Greenville Avenue, Teignmouth, TQ14 9NT.

Exeter & District Amateur Computer Club meets second Tuesday every month. Doug Bates, Fortescue House, Stoke Cannon, Exeter. Specialist meetings on third and fourth Tuesday.

Okehampton Computer Club. Contact Cherri Graebe, Okehampton 3523, or Okehampton Community College, Okehampton 3800. Meets 7pm each Monday during term time.

South Molton Computer Club. Meets at South Molton Tool Hire, Dootson House, Cooks Cross Industrial Estate, South Molton, North Devon, each Thursday at 7pm. Contact Nick Hews on 07695 3446.

Torbay Users Computer Club meets at Devon Computers, 39 Totnes Road, Paignton on Mondays fortnightly.

DORSET

Bournemouth Area Computer Club meets at Kinson Community Centre on the third Wednesday every month. Peter Hibbs, 54 Runnymede Avenue, Bournemouth, BH11 9SE. 0202 576547.

TOPIC meets at Canteen English Truck Centre on the second and fourth Wednesday every month at 7pm. David Washford, 1 Alexander Road, Bournemouth, BH6 5JA.

Purbeck Computer Club, contact 31 North Street, Wareham, Dorset BH20 1AD.

DURHAM

Darlington Computer Club, weekly meetings. L Boxell, 8 Vane Terrace, Darlington DL3 7AT. 0325 67766.

ESSEX

Genius Computer Club. 30 Webber House, North Street, Barking.

Great Dunmow Computer Club. Contact T Coombs, 4 Oakroyal House, Oakroyal Avenue, Great Dunmow, Essex CM6 1HQ.

Brentwood Amateur Computer Club, meets once a month. R Sadler, 18 Warescot Road, Brentwood, CM15 9HD. Brentwood 232463.

Springfield Computer Club meets on the first Friday of every month. Stephen Cousines, 1 Aldeburgh Way, Springfield, Chelmsford, CM1 5PB. 0245 50155.

Canvey Computer Club. Contact Dean Williams, 17 Mornington Road, Canvey Island, Essex SS8 8AT.

Colchester Microprocessor Group meets at University of Essex on the second and fourth Wednesday of every month at 7.30pm. Information Centre, University of Essex, near Colchester.

Colchester Computer Society. Meets at Severalls Hospital Social Club, Colchester. Contact A Potten, 14 Foxmead, Rivenhall, Witham, Essex CM8 3HD, Witham 516335.

Stanway School Computing Club, only school members at present. G Floyd, c/o Physics Department, Stanway School, Stanway, Colchester.

Nailsea Multi-User Club. Contact Valerie Boyde-Shaw, 0272 851337.

Romford Club, a new club. Mr D Norden, 138c Church Road, Romford.

Roundacre Micro Computer Users Club. Meets at the Roundacre Youth House, Laindon Link, Basildon every Wednesday at 7.30pm. Contact Mrs L Daden, Basildon 285119.

South East Essex Computer Society meets at Hockey Club at Roots Hall, near

Southend Football Stadium on Wednesday at 7.30pm. Robin Knight, 128 Little Waking Road, Little Waking, Southend-on-Sea. 0702 218456.

GLOUCESTERSHIRE

British Amateur Electronics Club. Mr J Margetts, 3 Bishopstone Close, Golden Valley, Cheltenham.

Cheltenham Amateur Computer Club meets on the third Tuesday of each month at 7.30pm. Mike Pullin 0242 25617.

GCHQ. D W Adam, 16 Court Road, Prestbury, Cheltenham.

Cheltenham Amateur Computer Club meets at Prestbury Scout Headquarters, on the third Tuesday of every month at 7.30pm. M Hughes, 36 Riverviews Way, Cheltenham.

HAMPSHIRE

Commodore Computer Club. Meets on the first Friday of every month at Bury House, Bury Road, Gosport at 7.30pm. Brian Cox. Fareham 280530.

Fareham and Portsmouth Amateur Computer Club. Alan Smith, c/o Francis Close, Lee-on-the-Solent, Gosport, Hants PO13 8HB. 0705 550907.

RAF Odiham Computer Club. Contact c/o Officer i/c, Royal Air Force, Odiham, Nr Basingstoke, Hants.

Southampton Amateur Computer Club meets at Crestwood Centre, Shakespeare Road, Boyatt Wood, Eastleigh, Hants. on the second Wednesday of every month at 7.30pm. Paul Blitz. Chandlers Ford 69050.

HEREFORD

Hereford Amateur Computer Club, proposed new club. Stuart Edinborough, 2 Warwick Walk, Bobblestock, HR4 9TG. 0432 269700.

HUMBERSIDE

Bridlington Microcomputer Club. Meets 7.30pm alternate Fridays at Old Star Inn, High Street, Bridlington. Contact D Compleman, 0262-601859.

Grimsby Computer Club meets at Grimsby Central Library fortnightly on Mondays at 7.30pm. Jensen Lee, 29 Park View, Cleethorpes. 0472 4259.

Scunthorpe & District Microprocessor Society meets at Community Centre, Lindun Street, Scunthorpe, every Tuesday at 7.30pm. G Hinch, 21 Old Crosby, Scunthorpe, South Humberside DN15 8PU.

KENT

Canterbury ACC proposed new club. Contact L Fisher, 21 Manwood Avenue, St Stephens, Canterbury, CT2 7AH.

Gravesend Computer Club. Meets at School Room Extra Tuition Centre, 39 The Terrace, Gravesend. Contact c/o The Extra Tuition Centre, 0474 50677.

Medway Amateur Computer & Robotics Organisation. Meets at 7.30pm on first Tuesday and third Wednesday of every month. Annual subs £5. Contact Paul Cameron, Unit 3, Walderslade Centre, Walderslade Road, Chatham, Kent, 0634-63036.

North Kent Amateur Computer Club meets at Lecture Theatre, Charles Darwin School, Jail Lane, Biggin Hill, on the first Thursday of every month at 7.30pm. Iain House, 28 Canadian Avenue, Catford SE6 3AS. 01-690 5441.

Orpington Computer Club meets at The Large Hall, Christ Church, Chaterhouse Road, Orpington, every Friday at 8pm-10.30pm. Mr R Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF. Orpington 20281.

National Personal Computer User Association. Eric Keeley, 11 Spratling Street, Manston, Ramsgate, Kent.

Sevenoaks School Computer Club. G Sommerhoff, Technical Centre, Sevenoaks School, Sevenoaks, Kent. 0732 456340.

Tonbridge & Tunbridge Wells ACC. Ray Szatkowski, 1 Cromer Street, Tonbridge. 0732 355960.

LANCASHIRE

Blackburn Micro Computer Club. Roger Longworth, 12 Sharp Close, Accrington.

Bolton Computer Club meets at E4/24 Bolton Institute of Higher Education, Deane Road, Bolton, on Thursdays. David Atherton, 16 Douglas Street, Asherton, Manchester M29 9FB. 0942 876210.

Burnley Computer Club. Meets at Burnley Technical College on Tuesdays, 7.30-11pm. Contact Clive Tallon, 27 Basnett Street, Burnley, Lancs.

Chorley Computer Club meets at Townley Arms, Chorley, every other Tuesday at 8pm. Tony Higson, 23 Brock Road, Chorley, Lancs. Chorley 68429.

Ribble Valley Computer Club meets at Staff Canteen, Pendle Carpets Ltd, West Bradford, on the second and fourth Monday of month at 7-9pm. Contact Ian Thornton-Bryar, 25 Southfield Drive, West Bradford, Clitheroe, BB7 4TU.

Lancaster & Morecambe Computer Club. Sarah Blackler. 0524 33553.

South Chadderton Computer Club meets at Turf Lane Centre, Turf Lane, Chadderton, on Thursdays at 7-9.30pm. David Sholes, 18 Beech Avenue, Oldham, Lancs.

LEICESTERSHIRE

East Leake Computer Club. Andrew Jones, 59 Bateman Road, East Leake, Loughborough, LE12 6NN.

Hawker Siddeley Computer Club. Contact R Wrathall, 6 Naseby Drive, Loughborough LE11 0WU.

LINCOLNSHIRE

Lincoln Computer Club, meets at Blandings Public House, High Street, Lincoln on the first and third Wednesday of every month. John Clifford, 448 Newark Road, Lincoln LN6 8RX. 0522 2168.

Skegness Computer Club, meets at County Hotel every other Monday, 7.30-9.30pm. Reg Potter, 118 Beresford Avenue, Skegness. 0754 3594.

LIVERPOOL

BBC Microgroup Liverpool meets at Old Swan Technical College, Liverpool, on the first Wednesday of month. Nick Kelly, 56 Queens Drive, Walton, L4 6SH.

LONDON

Croydon Computer Club. BBC group meets 7pm, first and fourth Tuesday of each month at Croydon Central Library. Contact Mr Khabaza, 10 Lawrence Road, South Norwood, London, SE25, 01-653 3207.

Computer Users Club. Tony Latham 01-304 3910.

East London Amateur Computer Club meets at Harrow Green Library, Cathall Road, E11, on the second and fourth Tuesday of month at 7-10pm. Fred Linger on 01-554 3288.

Forum-80 London. Leon Jay, 01-286 6207.

Forum-80 Wembley. Victor Saleh, 01-902 2546.

Harrow Computer Group meets at Harrow College of Higher Education, Room W24, Northwick Park, on alternate Wednesday at 7pm. Bazyle Butcher, 01-950 7068.

Imperial College Microcomputer Club meets at room 145, level 1, on Tuesdays at 7.30pm. Tim Panton, c/o I.C. Union Office, Prince Consort Road, London SW7 2BB.

London School Computer Club. Burlington Dances School, Dane Building, DuCane Road, Hammersmith.

Metropolitan Police Amateur Computing Club meets on the first Thursday of month at 7pm. S Farley, 01-725 2428.

68 Microgroup meets at Regents Park Library, Robert Street, NW1, on the third Tuesday of month at 7.30pm. Jim Anderson, 41 Pebworth Road, Harrow, Middlesex.

North London Computer Club meets at the Polytechnic of North London, Holloway, N7 8DB, on Monday, Tuesday, Wednesday and Thursday during term time and one evening a week during holidays. Robin Bradbeer, 01-607 2789.

Paddington Computer Club meets at Paddington College, 25 Paddington Green, W2 1NB. Peter Hill, 01-723 5762.

Post Office HQ Microcomputer Club meets at room B145, River Plate House, 12-13 South Place, off Moorgate, on the second Thursday of month. Vernon Quaintance, British Telecom Enterprises, Cheapside House, 138 Cheapside EC2U 6JH. 01-726 4716.

Queens Crescent Computer Club. Meets at Queens Crescent Library, 165 Queens Crescent, London NW5. 01-485 4551.

The SOBAT Computer Club meets once a fortnight. Mr T Kayani, 12 Calderon Road, London E11.

South East London Microcomputer Club meets at Thames Polytechnic, Greens Ends, Woolwich SE18, on alternate Wednesdays at 7pm. Peter Philipps, 61 Grainger Road, SE3. 01-853 5829.

Southgate Microcomputer Club meets at Room B106 Southgate Tech, fortnightly on Thursdays at 7.30pm. Kevin Pretorius 01-882 2282. See Prestel page 25820645.

West London Personal Computer Club meets at Back room, Fox & Goose pub, Hanger Lane, Alperton, on the first Tuesday of month at 7.45pm. Graham Brain, 01-997 8986.

MANCHESTER

Manchester Computer Club meets at the Department of Computer Science, Manchester University, Oxford Road, on the first and third Thursday of month at 7.30pm. David Wade, 061-941 2486.

Small Business Computer Users Club. Proposed new club to meet the last Tuesday of month. K Wadsworth, 061-740 7232 after 5pm.

South Trafford Microcomputer Club. Meets fortnightly. Contact Ian White, 16 Leicester Avenue, Timperley, Altrincham WA15 6HR, 061-969 2080.

MERSEYSIDE

Merseyside Microcomputer Group meets at Merchant Taylor's School, Crosby, on second Thursday month. Mr F Shaw, 14 Albany Avenue, Eccleston Park, Prescot. 051-426 5536.

Southport Computer Club meets weekly. Ian Bristone, 28 Weld Road, Southport, Merseyside PR8 2DL. 0704 64524.

Wirral Microcomputer Users Group meets at Birkenhead Technical College every Monday. J Phillips, 14 Helton Close, Birkenhead, Merseyside L43 9HP.

Wirral Computer Club. Contact Gary Metcalfe, 24 Marlston Avenue, Irby, Merseyside.

MIDDLESEX

Brigadier Computer Club. Meets on the first and third Monday of every month at Brigadier Youth Centre, Brigadier Hill, Enfield at 7.30 pm. Subs: £2. Contact Steve Ward, 28 Brodie Road, Enfield, Middx EN2 0EU. 01-363 3786.

Micromodeller User Association. Meets three times a year. Contact Phillip Matthews, Phillip Morris House, 21 High Street, Feltham TW13 4AD. 01-751 6388.

Sunbury Computer Club meets at St Benedicts Hall, Napier Road, Ashford, on the last Tuesday of month at 8pm. Simon Taylor, 8 Priory Close, Sunbury-on-Thames, Middlesex. Simon Clark, 83 Watling Street, Towcester, Northants NW12 7AG.

ZX Micro Club. Contact Paul Hargreaves, 10 The Ride, Brentford, Middx.

NORTHAMPTONSHIRE

Corby Universal Micro Club. Meets at Lodge Park Sports Centre fortnightly on alternate Wednesdays and Thursdays. Contact Peter Wilson, 26 North Cape Walk, Corby, tel: Great Oakley 742622.

South Northants Computer Group meets at Anchor House, Moat Lane, Towcester, on Wednesdays at 7.30pm.

NOTTINGHAMSHIRE

Ashfield Computer Club meets at Carsic Junior School, St Mary's Road, Sutton in

Ashfield on the first and third Thursday month. Derick Daines, c/o Cuttings Avenue, Sutton in Ashfield, Notts.

Eastwood Town Micro Computer Club meets at Devonshire Drive Junior School Wednesday at 5.45pm. Ted Ryan, 15 Queens Square, Eastwood, Nottingham NQ16 3BJ.

Nottingham Microcomputer Club meets at Castle Gate Centre, Nottingham, Monday at 7.30pm. Mr E Harvey, 68 Roseleigh Avenue, Nottingham NG3 6FH. Nottingham 608491.

Workshop Computer Group. Mr Andrews, Workshop 487327.

NORFOLK

Anglia Computer User Group. Jan Rejzl, 128 Templemere, Sprowton Road, Norwich. 0603-29652.

Brecklands Computer Club. Contact Andrew Hiom, 11 Annafewes Close, Theford, Norfolk. Meets each Saturday, 5pm at this address.

Dereham & District Computer Club. Meets at Middle School, Westfield Road, Toftwood, East Dereham on every second Wednesday at 7.30pm. Contact Mrs Fran Cook, Dereham 67732.

East Anglian Computer User's Group meets at Crome Community Centre, Telegraph Lane, Norwich. Gill Rijzi, 88 St Benedicts, Norwich.

OXFORDSHIRE

Association of Computer Clubs. Rupert Steele, St John's College, Oxford OX1 3JP. **Microsoc** meets at Clarendon Lab, Parks Road, Oxford, every week during term. Rupert Steele, St John's College, Oxford OX1 3JP.

Oxford Personal Computer Club. Len Phelps, Southport Cottage, Sutton Courtenay, Nr Abingdon, Oxon OX14 4AU.

Ridgeway Computing Club meets at Swan Hotel, East Isley, on the second Tuesday month. Mike Magney, Beavers, South Street, Blubury, Didcot, Oxon OX11 0JU.

SHROPSHIRE

Ludlow & District Microcomputer Club meets at Diocesan Education Centre, Lower Galdeford, Ludlow, on the second Monday of month at 7.30pm.

Shrewsbury Micro Club meets at Shrewsbury Shirehall once a month. Mr V Ives, 6 Bramley Close, Severn Meadows, Shrewsbury SY1 2TP.

Telford Computer Club meets at Telford ITEC on Monday 6-9pm. John Murphy, 10 Brichmore, Brookside, Telford TF3 1TF. 0952 595959.

SOMERSET

Sharp MZ80 Club, Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset. **Yeovil Computer Club.** D G Carrington, 2 Romsey Road, Yeovil, BA21 5XN.

STAFFORDSHIRE

Alsager Computer Club, meets at Alsager Comprehensive School, Stoke-on-Trent, Staffs, fortnightly on Tuesday. Rex Charlesworth, 09363 77270.

North Staffs Amateur Computer Club meets on the third Wednesday of each month. J Roll, 16 Hill Street, Hednesford, Staffordshire WS12 5DS.

ICL Birmingham Branch Micro Club, c/o WBA Ecclestone, 26 Browns Lane, Tamworth, Staffs.

Tame Valley Computer Club, Tim Marshall, 32 Milton Avenue, Leyfields, Tamworth, Staffordshire B79 8JG.

SUFFOLK

Haverhill Microcomputer Club, meets at St Marys' Church Hall, Camps Road, Haverhill, on the second, third and fourth Wednesday of month at 7.30 to 10.30pm. Andrew Holliman, 5 Trinity Close, Balsham, CB1 6DW, 022 029 583.

Newmarket Home Computer Group. Meets at Anchor House, Moat Lane, Towcester, at 7.30pm. Contact Simon Clark, 83 Watling Street, Towcester, Northants NN12 7AG, 0327 52191.

Suffolk Microcomputer Club meets monthly. Mr S Pratt, c/o Microtek, 15 Lower Brook Street, Ipswich.

SURREY

Ashted Computer Club meets on the last Thursday of month. Contact P Palmer, 8 Corfe Close, Ashted.

Deaf Microcomputer Users Group. Contact Chris Marsh, 3 Delaporte Close, Epsom, Surrey KT17 4AF.

Thames Valley Amateur Computer Club meets at Griffin, Caversham, on the first Tuesday of month. Brian Quarm, 25 Roundway, Camberley, GU15 1NR, Camberley 22186.

Ewell Micro Club, Dave De Silva, 316 Kingston Road, Ewell, KT19 0SU.

Farnham Computer Club, meets at Farnham 6th Form College, Morley Road, Farnham, on the second Wednesday of month. Adam Sharp, 14 Thorn Road, Boundstone, Farnham.

West Surrey Computer Club meets at Paddock Room, Green Man Public House, Burpham, Guildford, the first Thursday of month. Chris Karney, 0483 68121.

ITN Computer Club meets on Fridays. A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0485 62035.

CBBS London meets on Sundays 4-10pm. P Goldman, PO Box 100a, Surbiton, KT5 8HY.

Sutton Library Computer Club meets at Central Library, St Nicholas Way, Surrey, on the first Friday of month at 6pm and second and third Tuesday of month. Dave Wilkins 01-642 3102.

Midhurst & District Computer User Group. Meets at the Grange Centre, Midhurst, at 7pm on the second and fourth Thursday of every month. Contact Val Weston, tel: Midhurst 3876.

Association of London Computer Clubs, Len Stuart, 89 Mayfair Avenue, Worcester Park, KT4 7SJ.

SUSSEX

Arun Microcomputer Club meets at Wick Amenities Centre, Wick Farm Road, Littlehampton, on the first Monday of month at 8pm, and third Sunday of month at 6pm. P Cherriman, 7 Talbot Road, Littlehampton, West Sussex DN17 7BL.

Brighton, Hove & District Computer Club. Meets 7.30pm every second Wednesday at Southwick Community Centre. Contact J Smith, 30 Leicester Villas, Hove, E Sussex. **CVGC Video Games Club.** Contact G Bond, 7 Swift Lane, Langley Green, Crawley Sussex.

Mid-Sussex Microcomputing Club. Contact Jeff Hayden, 2 Hillary Close, East Grinstead, RH19 3XQ.

Richmond Computer Club meets at Richmond Community Centre, Sheen Road, on the second Monday of month at 8pm. Bob Forster, 18a The Barons St Margarets, Twickenham, Middlesex, 01-892 1873.

West Sussex Microcomputer Club meets at Room R06, Robinson Road Annexe, Crawley, on the first and third Monday of month. J Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, 0293-884207.

Worthing & District Microcomputer Club meets at Rose Wilmot Youth Centre, Littlehampton Road, Worthing, on alternate Sundays 11am-1pm. B. Thomas, 11 Gannon Road, Worthing, W. Sussex, BN11 2DT, 0903 36785.

TYNE & WEAR

Newcastle upon Tyne Personal Computer Society meets at Room D103, Newcastle Polytechnic on the first Tuesday of every month. Pete Scargill, 21 Percy Park, Tynemouth, 0632 573905.

WEST MIDLANDS

Cannock Computer Society meets at Cannock Computer Systems, Old Penkridge Road, Cannock, fortnightly. Terry Sale, 20 Redwood Drive, Chase Terrace, Walsall WS7 8AS.

Coventry Computer Circle. Contact Chris Baugh, 9 Hillman House, Smithford Way, Coventry CV1 1FZ.

Coventry Micro Club meets on Wednesdays at 7.30pm at Walsgrave Junior School. Jack Hewitt, 3a Boswell Drive, Walsgrave-on-Sowe, Coventry. Tel: 615543.

National Westminster Personal Computer Society. P Moore 021-236 6176, ext 382.

Walsall Computer Club meets at Park Hall Community School on the second and fourth Monday month 6.45-9.45pm. Alison Hunt, 58 Princes Avenue, Walsall, WS1 2DH, 0922 23875.

West Midlands Amateur Computer Club meets at Enfield School, Love Lane, Stourbridge, on the second and fourth Tuesday of month. John Tracey, 100 Booth Close, Brierley Hill, Kingswinford, 0384 70097.

WILTSHIRE

Chippenham and Calne, proposed new club. Matthew Jones, Pinhills, Calne SN11 0LY.

WORCESTER

Worcester & District Computer Club meets at Old Pheasant Inn, New Street, Worcester, on the second Monday month at 8pm. D Stanton, 55 Vauxhall Street, Rainbow Hill, WR3 8PA.

YORKSHIRE

Barnsley Co-Operative Computer User Group meets at Co-Op Social Club, Pogmore, Barnsley, on the last Tuesday month at 7.30pm. James Bridson, c/o 39 Kereforth Hall Road, Barnsley, South Yorks S70 6NF, 0226 41753.

Greenhead Grammar School Computer Club. Brian Smith, Greenhead Road, Keighley, West Yorks BD20 6EB, 0535 62828.

Huddersfield Computer Club meets every Monday. Chris Townsend, 760/4 Manchester Road, Linthwaite, Huddersfield, 0484 657299.

Leeds Microcomputer Users Group meets at 8 Regent Street, Chapel Allerton, fortnightly on Thursday at 6pm. David Parsons, 22 Victoria Walk, Horsforth LS18 4PL.

Pennine & District Computer Club meets at 26 Mill Hey, Haworth, W Yorks, on Saturday and Sunday. Douglas Bryant, 26 Mill Hey, Haworth, W Yorkshire, 0535 43007.

Program Power, R Simpson, 5 Wemsley Road, Leeds LS7 2BX, 0532 683186.

Shipley College Computer Group meets on Tuesdays. Paul Channell, tel: 0274 595731.

South Yorkshire Personal Computer Group meets at General Lecture Theatre, St Georges Building, Mappin Street, Sheffield, on second Wednesday month at 7.30pm. Paul Sanderson, 8 Vernon Road, Tetley, Sheffield S17 3QE.

Thurnscoe & District Micro Users' Club meets at Thurnscoe Comprehensive School, Physics Lab, Clayton Lane, Thurnscoe, Wednesday at 7.30pm during school term. Mr James Davis, 62 Tudor Street, Thurnscoe East, 0709 893880.

West Yorkshire Microcomputer Group meets on Tuesdays. Phillip Clark, c/o Suite 204, Crown House, Armley Road, Leeds LS12 2ES, 0532 632532.

York Computer Club meets at the Enterprise Club every Monday at 8pm. K Thomas, Green Lea, Ripon Road, Harrogate, HG1 2BY, 0904 38239.

SCOTLAND

Bishopthorpe Computer Club meets at 'Cwa Ben', Sachelcourt Avenue, Bishopthorpe, Renfrewshire, on Sunday once a month Alasdair Law, 10 Dunglass Road, Bishopthorpe, Renfrewshire PA7 5EF.

Edinburgh Home Computing Club meets at Claremont Hotel, Edinburgh, on the 2nd, 3rd and 4th Wednesday of month. I. Robertson, 031 441 2361.

Scottish Amateur Computer Society, Mike Anthony, 46 Moredun Park Gardens, Edinburgh EH17 7JR.

Central Scotland Computer Club meets at Falkirk College of Technology, Grangemouth Road, Falkirk, on the first and third Thursday of month. James Lyon, 78 Slamannan Road, Falkirk FK1 5NF.

Fire Computer Users Club meets fortnightly. Murray Simpson, 31 Tom Steward Lane, St Andrews, Fife, KY16 8YB.

Grampian Amateur Computer Society meets at 35 Thistle Lane, Aberdeen, on the second and fourth Monday every month at 7.30pm. Alan Morrison, 21 Beech Road, Westhill, Skene, Aberdeenshire AB3 6WR.

Kemnay Computer Club meets weekly. S Stubbs, 15 The Glebe, Kemnay, Inverurie, Aberdeenshire.

Inverness Personal Computing Club meets every second Tuesday at 7.30pm. Gyl Mackenzie, 38 Ardconnell Street, Inverness IV2 3EX, 0463 220922.

Perth & District Amateur Computer Society meets at Hunters Lodge Motel, Bankfoot, on the third Tuesday of month at 7.30pm. Alastair McPherson, 154 Oakbank Road, Perth PH1 1HA.

Strathclyde Computer Club meets at Wolfson Centre, 106 Rottenrow, Glasgow, on the third Wednesday of month. B Duffy, 24 Lomand Drive, Condorrat, Cumbernauld G4 8NW.

WALES

Abergele Computer Club meets at Abergele CI Offices every Thursday at 7.30-10pm. W Jones, 77 Millbank Road, Rhyl, Clwyd.

Colwyn Computer club meets at the Greens Hotel, Colwyn Bay, at 7pm. Contact D Bevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.

Connah's Quay Computer Club. Meets second and fourth Thursday of each month at the Community Centre, Cable Street, Connah's Quay, at 7pm. Contact G Johnson, tel Deeside 821945.

Gwent Amateur Computer Club meets at St Mary's Institute, Stow Hill, Thursday at 7.30pm. Rothery Harris, 16 Alanbrook Avenue, Newport, Gwent, Wales NPT 6QJ.

Llantwit Major Computer Club. Meets at Adult Education Centre, Llantwit Major, every Tuesday. Contact Douglas Mountain, 16 Denbigh Drive, Llantwit Major, South Glamorgan CF6 9GQ.

Mold Computer Club. Meets 7.30pm on first and third Thursday of each month at the Daniel Owen Centre, Earl Street, Mold. Contact G Johnson, 18 Daytona Drive, Northop Hall, Mold, Clwyd, Wales. Tel Deeside 821945.

Milford Central Computer Club. Open to schoolchildren, meets every lunch hour and evening. Contact Harry Evans, Milford Central School, Prioryville, Milford Haven, Dyfed, 043 784 571.

Pencoed Amateur Computer Club meets fortnightly on Saturdays at Pencoed Welfare Hall. Philip Williams, 38 Bryn Rhedyn, Pencoed, Bridgend, Mid-Glamorgan CF35 6TL, 0656 860307.

Pontypool Computer Club meets at The Settlement, Roackhill Road, Pontypool, Gwent, on Friday. Graham Loveridge, on Pontypool 2827.

Swansea & Southwest Wales Amateur Computer Club meets on the last Friday every month. Paul Griffiths, 1 Prescelli Road, Penlan, Swansea SA5 8AF.

Swansea Computer Club. Meets at No 10 (pub), Union Street every Tuesday at 7.30pm. Contact Robert Palmer, 044 123 602.

Wrexham & District Computer Club. Meets each Thursday. Contact Mike Houghton, 1 Snerwell Avenue, Wrexham, Clwyd, Wales.

NORTHERN IRELAND

North Down Micro Users Club. Meets at Bangor Central Library, Hamilton Road, every fourth Monday. Contact A Robson, 0247 67060.

DATA BASICS

PCN Databasics is presented in three-week cycles. This week it's the turn of software packages, next week hardware, and two weeks from now, peripherals. We can't fit all software packages in, so we've compiled a selection, giving best sellers from 100 publishers and distributors.

We confined coverage to five main types of applications: business, education, games, home and utility. All details published are the latest available.

Companies wanting to add their best-selling packages to Databasics, or wanting to update information already here, should send details to: Databasics, *Personal*

Computer News, VNU, 62 Oxford Street, London W1A 2HG.

APPLICATION Each software package is listed alphabetically by its application.

PRICE includes VAT.

MACHINE/OPERATING SYSTEM on which the best selling packages runs.

OTHER VERSIONS indicates whether or not the package runs on a different machine or operating system.

MEDIA SUPPLIED indicates in what format the package comes — either cassette, disk, or cartridge.

MAIL ORDER AVAILABLE tells you whether or not the package is available by mail order.

HARDWARE REQUIRED shows the need for special hardware, such as disk drive, joystick or printer.

PUBLISHER/DISTRIBUTOR This code refers to the distributor code table at the end of the listings, which will give the name and telephone number of the publisher/distributor.

COMMENTS — any other points of interest.

SOFTWARE

BUSINESS

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Mail order avail.	Hardware Required	Publisher/ Distributor	Comments
Accounting	£3,320	Apple II	●	Financial Controller	48K	●	●	●	S1	Also on Apple IIE. 8 modules (£402.50 each) — sales, purchase, invoicing, etc.
	£339.25	Apple II	●	General Ledger	48K	●	●	●	C1	Supports 1000 accounts and 100 analyses. Self-balancing, full audit trail.
	£552	Apple II	●	Informex Integrated Accounting System	48K	●	●	●	I1	Contains nominal, sales, purchase ledger + VAT. Can handle 800 accounts.
	£1,147.70	Apple II	●	Informex Integrated Business System	48K	●	●	●	I1	Contains accounting system modules plus invoicing + stock.
	£172.50	Apple II	●	Micro-General Ledger	48K	●	●	●	G1	Also on ITT 3030 and Basis 108. Goes through profit/loss + balance sheets.
	£402.50	Apple II	●	Nominal Ledger	64K	●	●	●	J1	Also on Sirius, IBM PC, Apple III + UCSD. Requires 132 column printer.
	£431.25	Apple II	●	Payroll	48K	●	●	●	C1	Supports weekly, monthly, + per monthly. Up to 350 employees per disk.
	£402.50	Apple II	●	Purchase Accounting & Cost Control	64K	●	●	●	J1	Requires 132 column printer, also Sirius, IBM PC, Apple III, UCSD.
	£402.50	Apple II	●	Sales Accounting System	64K	●	●	●	J1	Also on Sirius, IBM PC, UCSD. Provides conventional ledger.
	£339.25	Apple II	●	Sales Ledger	48K	●	●	●	C1	Supports 700 + accounts. Direct posting, credit control & 100 analyses, self balancing
	£1,725	Commodore 8000	●	Auditman	32K	●	●	●	C4	Also on Commodore 4000. Complete accounts production system.
	£2,052.75	Commodore 8000	●	Data-Lex	32K	●	●	●	D1	Designed for solicitors + others who need to separate office & client's accounts.
	£2,070	Commodore 8000	●	Microfacts	32K	●	●	●	M1	Also on Commodore 700, Victor & Sirius. £345 per module. Integrated accounting.
	£454.25	Commodore 8000	●	Micro-simplex	32K	●	●	●	M2	Also on Commodore 64 (£172.50). Needs printer. For smaller retail business.
	£2,300	Commodore 4000	●	Pegasus Integrated Accounting Suite	32K	●	●	●	P3	Also on MS-DOS (128K). Contains six stand alone modules.
	£116.00	CP/M	●	CalcStar 1.4	160K	●	●	●	M10	Also on IBM PC, MS-DOS. Integrates with WordStar and InfoStar.
	£1,437.50	CP/M	●	Aurora Integrated Accounting Package	64K	●	●	●	G1	Five stand alone modules. Sales, invoicing, purchase, nominal and stock.
	£2,760	CP/M	●	Boss	64K	●	●	●	F1	Seven stand alone modules. Can link to Autowriter & Autoindex.
	£805	CP/M	●	Cash Book Accounting	64K	●	●	●	S2	Also on CP/M-86 and MS-DOS. Amalgamation of sales, purchase & nominal ledger.
	£2,300.00	CP/M	●	dBFlex	48K	●	●	●	E1	Open item six module accounting system, (£575.00) per module. Works with dBase II.
	£402.50	CP/M	●	Exact	64K	●	●	●	S3	Also on MS-DOS. Includes six modules — invoicing, ledgers, stock and payroll.
	£1,840	CP/M	●	ISBS-S	48K	●	●	●	G2	Also on CP/M-86. Contains seven modules.
	£2,271.25	CP/M	●	Multi-Index	64K	●	●	●	B1	Also on MP/M & PC-DOS. Contains five modules. Sales, nominal, VAT & stock control
	£569.25	CP/M	●	Nucleus	64K	●	●	●	C2	Also on MS-DOS. Disk drives of 280K needed. A program generating system.
	£1,431.75	CP/M	●	Padmede Business Control System	64K	●	●	●	P2	Five modules (£286.35 per module). Nominal, sales, purchase, invoicing, stock.
	£1,380	CP/M	●	Motor Dealers Part Distribution	64K	●	●	●	S2	Also on CP/M 86 & MS-DOS. Combines stock control, order processing ledgers.
	£1,868.75	CP/M	●	Peachtree Basic Accounting Systems	48K	●	●	●	P1	Also on MP/M & MZ-DOS. Available on hard disk (£2,156.25). 5 stand alone modules.
	£287.50	CP/M	●	Sales Ledger	64K	●	●	●	S2	Also on CP/M 86 and MS-DOS. Flexible ledger system.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Hardware Required	Publisher/ Distributor	Comments
						Cassette	Mail order avail.		
						Disk			
							Disk drive		
							Joystick		
							Other		
Agriculture	£45.42	Sharp MZ80A	●	Easy VAT	48K	●	●	K1	Also on Sharp MZ80B & M200K. VAT record system.
	£1,150	Apple II		Dairy Package	64K	●	●	F2	Available on floppy or hard disk. Files individual cow production, with herd summaries
	£1,725	Apple II		Financial Management Program	64K	●	●	F2	Available on floppy or hard disk. Accounts for farm/estate management.
	£1,150	Apple II		Management Program	64K	●	●	F2	Available on floppy or hard disk. Monitors individual field activities, budgets, etc.
	£35	Newbrain		Agricultural Field costings	32K	●	●	P8	Field data costings
Bill of Materials	£373.75	CP/M	●	Fastbill	60K	●	●	T2	Also on MS-DOS & TRS-DOS. Will give parts explosion at 10 levels, 99 items/level.
Bookkeeper	£56.35	Apple II		Apple Bookkeeper	48K	●	●	H1	Needs printer. Keeps petty cash, sales, other business books, sorts, analysis etc.
Building Specifications	£460	Commodore 8000	●	National Building Specifications	32K	●	●	C3	Also on Commodore 4000. Used with Wordcraft. Produces building specifications.
Business Graphics	£471.50	16-bit machines		Micro-Graphpower	128	●	●	I2	Needs plotter. Business graphics which plots business data.
	£120.75	Apple III	●	Business Graphics	48K	●	●	P6	Also on Apple II (£125.35). Supports range of plotters & pie-charts, etc.
	£149.50	IBM PC	●	Graph Magic	96K	●	●	F1	Also on Apple II, III. Displays files graphically. Reviewed 18.3.83.
Business Management	£569.25	Commodore 8000		The Administrator	96K	●	●	S11	Complete applications generator. No programming required.
	£4,140	CP/M		Peachtree Business Management System	48K	●	●	P1	Also on MP/M & Unix. Available on hard disk (£6,900). Six modules for single user.
	£684.25	IBM PC	●	Tomorrow's Office	128K	●	●	S11	Also on Sirius, Victor & MSDOS. Complete applications generator.
Cash Book	£224.25	Commodore 4000	●	Electronic Cash Book	32K	●	●	D1	Also on Commodore 8000 & 64. For small business or add-on products.
Cataloguing	£46.00	Apple II		Floppy Cat	48K	●	●	P4	Enables user to catalogue & store all information.
	£35.00	Newbrain		Dentists NHS Schedule	32K	●	●	P8	Aid for checking statutory returns.
Estate Agents	£1,092.50	Apple II		Commercial Agency Systems	48K	●	●	C7	Matches in both directions with lists, labels and letters.
	£977.50	Apple II	●	Cyberpress Clients Recoverable Costs	48K	●	●	C7	Also on Rair Black Box. Designed to keep record of incurred expenditures.
	£1,121.00	Apple II	●	Cyberpress Residential System	48K	●	●	C7	Also on Rair Black Box. An applicant & property matching system.
	£419.75	CP/M	●	Estate Agents Match & Mail	56K	●	●	S4	Matches & prints out potential customers for every property.
Financial Accounting	£569.25	Commodore 8000		Finplan	32K	●	●	M3	Also on Commodore 3, 4, & 8000, Vic-20 and Commodore 64. £46.57 on floppy disk
	£287.50	Commodore 8096		The Financial Director	96K	●	●	D1	Designed to handle large & complex planning & financial applications.
Financial Planning	£44.85	Commodore Pet		Busicalc	16K	●	●	S5	Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£188.60	Apple II	●	VisiCalc	48K	●	●	R1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£345.00	CP/M		Bottom-Line Strategist	48K	●	●	P4	A business/project forecasting program. Allows user to test business assumptions.
	£454.25	CP/M		Fastplan	64K	●	●	C5	Needs double density disks. A file based modelling system for business planners.
	£281.75	CP/M	●	Master Planner	64K	●	●	C5	Also on MS-DOS & CP/M 86. Needs 80 column printer. Upgrade of a spreadsheet.
	£396.75	CP/M	●	Micro Plan	64K	●	●	B1	Also on MP/M. Spreadsheet financial planner.
	£343.85	CP/M		Minimodel Financial Modelling	48K	●	●	G1	Needs 80 column screen. Model consolidation facility, colour option.
	£182.85	CP/M	●	Multi-Plan	48K	●	●	P4	Also on PC-DOS, Cromix, Fortune, Corvus & Sirius. Second generation spreadsheet.
	£44.85	CP/M		Plannercalc	64K	●	●	C5	Needs 80 column screen. Entry level system for spreadsheet planning.
	£218.50	CP/M		SP2020	48K	●	●	G2	Forecast effects of proposed actions. Aid to management decision-making.
	£172.50	CP/M		Supercalc	128K	●	●	A1	Electronic worksheet, representing a large flexible accounting work pad.
	£212.75	CP/M		Super Calculator	48K	●	●	E1	Spreadsheet calculator.
	£178.25	CP/M		T-Maker	48K	●	●	L1	Utility for analysis & presentation of numerical data & test material.
	£224.25	MS-DOS		Pulsar Business System	128K	●	●	A1	Consists of eight integrated packages & provides commercial accounting functions.
	£339.25	Osborne	●	PADA/C	64K	●	●	P2	Also on CP/M. Two systems. Incomplete records accounting, time/cost recording.
	£632.50	UCSD-P System		Microfinesse	128K	●	●	P5	Financial modelling program for businessmen.
	£741.75	UCSD-P System	●	Micro-Modeller	48K	●	●	I2	Also on CP/M & MS-DOS. Designed for large corporations.
Industrial Costing	£747.50	Apple II	●	Stock & Production Costing	48K	●	●	A2	Also on Apple IIE & III & Sirius. Available on hard disk. Needs Pascal system.
Insurance Accounting	£1,380	Commodore 4000	●	Insurance Man	32K	●	●	C4	Also in Commodore 8000, provides insurance broker with sales ledger.
Insurance Broking	£5,462.50	ICL DRS20		HS-100	64K	●	●	H2	Requires 16 or 27 Mb hard disk to run off. Maintains client & policy records.
Integrated Software	£569.25	IBM PC		Context MBA	256K	●	●	B2	Also on Sirius & Victor. Comprises word processor database management system.
	£908.50	Commodore 8000	●	Silicon Office	256K	●	●	F1	Integrated spreadsheet modelling, graphics, WP, database & communications.
Linear Programming	£373.75	CP/M	●	Optimiser	48K	●	●	C6	Also on Apple. Management tool for optimizing the deployment of scarce resources.
Local Authority	£862.50	Commodore 8000	●	P.U.S.W.A.	96K	●	●	M3	Also on Hytec. Monitors road holes under Public Utilities Street Work Act (1950).
Mailing	£86.25	CP/M		Mailing List	56K	●	●	S4	Works with Super file. Prints labels, files, names & addresses. Mail merge facility.
	£149.00	CP/M	●	Mail Merge	56K	●	●	M10	Also on IBM PC, MS-DOS. Integrates with WordStar.

		Price Inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Media Supplied	Mail order avail.	Hardware Required	Publisher/ Distributor	Comments
Business Game	BBC Model A	£9.95	BBC Model A	●	Business Game	16K	●	●	●	●	W1	Also on Model B. Two games for economics, business & general studies, teaching.
	BBC Model B	£5.95	BBC Model B	●	Inkosi	32K	●	●	●	●	C9	Also on Vic-20. Rule for ten years, overcoming obstacles, e.g. famines.
	Research Machine 380Z	£14.38	Research Machine 380Z	●	Symbols To Moles	31K	●	●	●	●	H4	Also on Apple II. Practise using chemical symbols, writing & mole concept.
	Apple II	£37.89	Apple II	●	Bumble Plot	48K	●	●	●	●	P4	A set of five programs for developing graphics and maths skills. For children 8 to 13.
Children	Apple II	£29.84	Apple II	●	Face Hanger	48K	●	●	●	●	P4	Also on IBM PC. Designed for children to learn computer keyboard by building up face.
	Apple II	£37.89	Apple II	●	Gertrude's Secret	48K	●	●	●	●	P4	An educational game to teach logical thinking & planning. For children aged 6-9.
	Atari 400	£9.80	Atari 400	●	Jigsaw Puzzles	16K	●	●	●	●	T4	Also on Atari 800. Has 16 puzzles and optional difficulty.
	BBC Model B	£9.95	BBC Model B	●	Letters	32K	●	●	●	●	C9	Designed for children aged 4-6 & for dyslexic & remedial children.
	BBC Model B	£9.95	BBC Model B	●	Metrics	32K	●	●	●	●	C9	Also on Vic-20 + Spectrum. Structure of metric system, for children aged 10-15.
	BBC Model B	£5.95	BBC Model B	●	Pascal	32K	●	●	●	●	C9	Also on Vic-20. Shows construction of Pascal Triangle and tests on it.
	BBC Model B	£5.95	BBC Model B	●	Sequences	32K	●	●	●	●	C9	Also on Vic-20. Demonstrates number patterns.
	BBC Model B	£6.50	BBC Model B	●	The Early Stages	32K	●	●	●	●	H3	Reading aid. Plays nursery rhymes. Available on disk.
	BBC Model B	£4.50	BBC Model B	●	Super Hangman	32K	●	●	●	●	I4	Version of famous game. High resolution graphics. 800 words or enter own choice.
	BBC Model B	£9.95	BBC Model B	●	Tree of Knowledge	32K	●	●	●	●	A9	Interactive program teaching categorisation. Simplified information retrieval.
	Sharp MZ80A	£4.95	Sharp MZ80A	●	Giant Maths	32K	●	●	●	●	S8	Also on MZ80K. Big screen figures & humorous error messages. 5 to 11 years.
	Sharp MZ80A	£4.95	Sharp MZ80A	●	Rocket	3K	●	●	●	●	S8	Also on MZ80A. Four difficulty levels. For five to 11 year olds.
	Sharp MZ80A	£9.20	Sharp MZ80A	●	Teach Tables	48K	●	●	●	●	K3	Also on MZ80K. Plays like game but motivates children to improve their ability.
	Sharp MZ80K	£4.95	Sharp MZ80K	●	Master Builder	48K	●	●	●	●	S8	Also on MZ80A. Repair a wall using random blocks. Teaches spacing.
	Spectrum	£5.25	Spectrum	●	Alphabet	48K	●	●	●	●	W2	'Picture for each letter of the alphabet. Option for lower case.' Aimed at ages 2-6.
	Spectrum	£5.25	Spectrum	●	Adding and Subtracting	16K	●	●	●	●	W2	For children aged 3-7. Three animated programs with full graphics.
Classroom Monitor	UCSD-P	£322.00	UCSD-P	●	Classroom Monitor	64K	●	●	●	●	K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.
	Sharp MZ80K	£28.75	Sharp MZ80K	●	Broadwater Economics Simulation	16K	●	●	●	●	W1	Also on Commodore Pet & BBC. Simulates micro & macro economics.
	Research Machine 380Z	£14.38	Research Machine 380Z	●	Repondez	31K	●	●	●	●	H4	Also on Apple II. Practising French verb formation (present tense).
	Sharp MZ80A	£9.20	Sharp MZ80A	●	French Conjugate	48K	●	●	●	●	K1	Also on MZ80K. Automatically conjugates regular verbs into tenses.
Graphics	Sharp MZ80A	£9.20	Sharp MZ80A	●	French Verbs	48K	●	●	●	●	K1	Also on MZ80K. Allows user to impart up to 20 verbs & eight tenses at a time.
	BBC Model B	£8.00	BBC Model B	●	Painter	32K	●	●	●	●	A5	Also on Spectrum (£5.75). Atom (£6.90) & on disk.
	BBC Model B	£9.95	BBC Model B	●	Creative Graphics	16K	●	●	●	●	A9	Book available (£7.50). Designed to illustrate BBC graphics.
	Sharp MZ80A	£20.13	Sharp MZ80A	●	Kings & Queens	48K	●	●	●	●	K1	Also on MZ80K. Facts & figures on English monarchs since 1066.
History	Sharp MZ80A	£7.95	Sharp MZ80A	●	Multilinguist	3K	●	●	●	●	S8	Also on MZ80K. A language tutor to suit all European languages.
	BBC Model B	£8.95	BBC Model B	●	Angle	32K	●	●	●	●	C9	Also on Spectrum. Includes four programmes designed to teach simple geometry.
	BBC Model A	£9.95	BBC Model A	●	Algebraic Manipulations	16K	●	●	●	●	W1	Also on Model B. Includes four programs designed for use in maths teaching.
	IBM PC	£82.80	IBM PC	●	Fact Track	64K	●	●	●	●	I3	Learning basic arithmetic. Presents simple two-line sums in random order.
Meteorology	Sharp MZ80A	£46.00	Sharp MZ80A	●	Curve Fitting	48K	●	●	●	●	K3	Also on MZ80K. Calculates, intercepts & plots power curve.
	Sharp MZ80A	£9.20	Sharp MZ80A	●	Directed Numbers	48K	●	●	●	●	K3	Also on MZ80K. Teaches difficult mathematical functions.
	Sharp MZ80A	£9.20	Sharp MZ80A	●	Divisor Advisor	48K	●	●	●	●	K3	Also on MZ80K. Teaches division at a variety of skill levels.
	Sharp MZ80A	£27.60	Sharp MZ80A	●	Numerical Integration	48K	●	●	●	●	K3	Also on MZ80K & B. Teaches Simpson's Rule.
Morse Code	Spectrum	£5.25	Spectrum	●	Counting	16K	●	●	●	●	W2	Graded programs. 'Good as a first introduction to numbers.' Aimed at ages 3-6.
	Research Machines 380Z	£23.00	Research Machines 380Z	●	Weather	31K	●	●	●	●	H4	Also on Apple II. Gives synoptic charts. Teaches elementary meteorology.
	Sharp MZ80A	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●	●	●	●	K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
	Research Machines 380Z	£14.38	Research Machines 380Z	●	Lenses	31K	●	●	●	●	H4	Also on Apple II. Illustrates formation of images by lenses using ray diagrams.
Typing	Sharp MZ80A	£9.20	Sharp MZ80A	●	Casino Chips	48K	●	●	●	●	K3	Also on MZ80K. Uses radioactive chips to teach half-life concept.
	CP/M	£28.75	CP/M	●	Touch'n'Go	48K	●	●	●	●	C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Owerly keyboard.
	IBM PC	£31.05	IBM PC	●	Typing Tutor	64K	●	●	●	●	I3	Presents exercises for learning touch typing or for improving existing skills.

GAMES

Adventure	Atari	£17.95	Atari	●	Arrow of Death	16K	●	●	●	●	C8	Also runs on TRS-80, BBC, Vic-20. A 'classic text adventure'.
	BBC Model B	£7.99	BBC Model B	●	Adventure	16K	●	●	●	●	M7	Also runs on Atom. 'Many rooms to explore and many hazards to overcome'.
	BBC Model B	£9.95	BBC Model B	●	Philosopher's Quest	16K	●	●	●	●	W1	'Progress through a world of fiendish puzzles.'
	BBC Model B	£9.95	BBC Model B	●	Sphinx	16K	●	●	●	●	W1	'A classic adventure, moving through caves avoiding hazards to collect treasure'.
	Commodore Pet	£13.80	Commodore Pet	●	Hitch-Hikers Guide to the Galaxy	32K	●	●	●	●	S5	Also runs on Commodore 64, Vic-20, 3000, 4000, 8000. 'Involved, textual game'.
	Commodore Pet	£18.40	Commodore Pet	●	Pythonesque	32K	●	●	●	●	S5	'Increasingly difficult textual game based on Monty Python'. Disk available (£20.12).

	£8.00	Dragon 32	Escape	32K	●	●	●	●	M12	Needs joystick. A 3D maze game. Get clues from 15 rooms for code of elevator'.
	£8.00	Dragon 32	Flipper	32K	●	●	●	●	M12	'A game of intrigue and strategy. Requires an agile mind and a lot of fore-thought'.
	£8.00	Dragon 32	Mansion Adventure	32K	●	●	●	●	M12	'Wind your way through an old mansion picking up clues to find the diamond'.
	£7.95	Dragon 32	Wizard War	32K	●	●	●	●	S7	Needs joystick. Magical combat for two to nine players, interactive duel'.
	£35.00	IBM PC	Adventure in Serema	64K	●	●	●	●	I3	Needs colour graphics adaptor and direct drive colour monitor for use.
	£6.90	Oric	Zodiac	16K	●	●	●	●	A5	Also runs on Atom. A thinking persons adventure game'.
	£12.07	Sharp MZ80A	Adventure	48K	●	●	●	●	K1	Also runs on Sharp MZ80B and MZ80K. 'An interactive adventure game'.
	£12.07	Sharp MZ80A	Quest	48K	●	●	●	●	K1	Also runs on Sharp MZ80B and MZ80K. 'Dungeons & Dragons type game'.
	£7.95	Sharp MZ80K	Nightmare Park	48K	●	●	●	●	S8	Also runs on MZ80A. 'Cross Nightmare Park. Every few steps play game or task'.
	£7.95	Sharp MZ80K	Tombs of Karnak	48K	●	●	●	●	S8	Also runs on MZ80A. Bargain for items required before entering tombs'.
	£5.95	Spectrum	Faust Folly	16K	●	●	●	●	A6	'A 16K adventure with the same traps, magic, fiends, treasure as the 48K game'.
	£14.95	Spectrum	The Hobbit	48K	●	●	●	●	M8	'Object is to get treasure. For one player. Can instruct computer in ordinary English'.
	£5.00	Spectrum	Orb	16K	●	●	●	●	I5	Also runs on Dragon 32 and Commodore Vic-20. 'Explore labyrinth and destroy Orb'.
	£10.00	Spectrum	Pimania	48K	●	●	●	●	A7	Also runs on Sinclair ZX81, BBC 13, Dragon 32. Reviewed 18.3.83.
	£5.00	Spectrum	The Quest	48K	●	●	●	●	I5	Also runs on Dragon 32. 'Fighting adventure game'.
	£5.00	Spectrum	Star Trek	48K	●	●	●	●	I5	Also runs on Dragon 32 and Commodore Vic-20. 'Hunt down the Klingon in space'.
	£5.95	Spectrum	Slippery Sid	16K	●	●	●	●	S9	Needs joystick and keyboard to use. 'Snake type game'.
	£10.06	Tandy TRS-80 I	Mysterious Adventurer	16K	●	●	●	●	M6	Also runs on Tandy TRS-80 III, Genie I, II, Colour Genie and BBC B.
	£4.95	Texas Instruments 99/4A	Forbidden City	16K	●	●	●	●	A8	'You have to explore a deserted alien city with many hazards on the way'.
	£3.95	Texas Instruments 99/4A	Sorcerers' Castle	16K	●	●	●	●	A8	'You are trying to rescue the captured princess'.
	£7.50	BBC Model B	Atlantis	32K	●	●	●	●	I4	'Guide submarine through caverns & destroy enemy'.
Arcade type	£9.99	Commodore Vic-20	Night Crawler	5K	●	●	●	●	R2	'A Centipede style game. Fast action, graphics and sound effects'.
	£5.50	Spectrum	Arcadia	16K	●	●	●	●	I6	Also on Commodore Vic-20. '12 levels of aliens attacking in different ways'.
	£3.95	Spectrum	Ground Attack	16K	●	●	●	●	S9	'Variable speeds allows this game to be played by everyone'.
	£5.95	Texas Instruments 99/4A	Bomber	16K	●	●	●	●	A8	'Must land plane & bomb skyscrapers'.
	£4.95	Spectrum	Cyber Rats	16K	●	●	●	●	S9	Needs joystick and keyboard to run.
Asteroids type	£6.95	Spectrum	Meteor Storm	16K	●	●	●	●	Q1	'Progressive difficulty, variety of controls'.
	£4.95	Spectrum	Time-Gate	48K	●	●	●	●	Q1	'Time travel, 3D graphics, colour, cockpit view and instrument display'.
	£4.95	ZX81	Asteroids	4K	●	●	●	●	S9	'Fast moving, suitable for all ages'.
Ballooning	£14.95	Atari 400	Up Up Away	16K	●	●	●	●	S13	Reviewed in PCN week ending April 29. Also on Atari 800. Available on disk.
Centipede type	£7.99	Dragon 32	Caterpillar	32K	●	●	●	●	M12	'A new generation munching game'.
Chess type	£7.99	BBC Model B	Chess	16K	●	●	●	●	M7	'Machine code, high resolution graphics with many play options'.
	£24.95	Dragon 32	Cyrus Chess	32K	●	●	●	●	D3	'Won European microcomputer chess championship 1981. Nine levels of difficulty'.
	£14.50	Sharp MZ80A	Chess	48K	●	●	●	●	K1	Also on Sharp MZ80B & MZ80K. '14 levels of difficulty'.
	£42.95	Texas Instruments 99/4A	Chess	16K	●	●	●	●	T5	'Different difficulty levels. Will solve problems. Can teach chess'.
Darts	£19.99	Atari 400	Darts	8K	●	●	●	●	T4	Also on 800. 'Aim & throw — the computer does the arithmetic'.
Defender type	£22.80	Atari 400/800	Submarine Commander	16K	●	●	●	●	T4	'One player. Nine levels of difficulty. Destroy shipping. Oxygen levels, fuel etc'.
	£9.95	BBC Model B	Planetoid	32K	●	●	●	●	A9	'A game of speed & skill'. Available on floppy disk (£11.50).
	£7.95	Commodore Vic-20	Alien Blitz	5K	●	●	●	●	A3	Needs joystick to run. 'Difficulty levels, colour & sound'.
	£9.99	Commodore Vic-20	Annihilator	3K	●	●	●	●	R2	'Based on Defender'.
	£6.95	Spectrum	Penetrator	48K	●	●	●	●	M8	'Two levels of difficulty difficulty'.
	£21.95	Ti 99/4A	Parsec	16K	●	●	●	●	T5	'Increasingly difficult. After four onslaughts pass through to next stage'.
Flight Simulator	£22.80	Atari 400	Jumbo Jet Pilot	16K	●	●	●	●	T4	Also Atari 800. Ten difficulty levels. View through cockpit with flight instrumentation'.
	£7.95	Spectrum	Flight Simulation	48K	●	●	●	●	S10	Also on ZX81 (£5.95). Shows control panel & control view'.
	£17.20	Tandy TRS-80	Jumbo	16K	●	●	●	●	M6	Also on Genie I, II & BBC Model B. 'Simulation of piloting a Jumbo'.
Football	£29.99	Atari 400	Kick Back	8K	●	●	●	●	T4	Also available on Atari 800. Needs joystick to run. 'Beat the high score'.
	£19.55	Atari 400	Soccer	8K	●	●	●	●	T4	Also on Atari 800. 'Aerial view of field'. Reviewed 11.3.83.
Frogger type	£5.50	Commodore Vic-20	Wacky Waiters	3.5K	●	●	●	●	I6	'Waiter serving drinks in hotel. Has to hop from lift to lift'.
	£9.99	Commodore Vic-20	Hopper	3K	●	●	●	●	R2	'A version of Frogger'.
	£5.95	Spectrum	Horace Goes Ski-ing	16K	●	●	●	●	S10	'Sequel to Hungry Horace. He must cross busy road, fetch skis & ski down slope'.
Golf	£7.95	Dragon 32	Golf	32K	●	●	●	●	S7	'For one or two players. Full handicapping system'.
	£3.75	Spectrum	Golf	16K	●	●	●	●	R3	'For one or two players. Choice of nine or 13 holes'.
	£3.75	Sinclair ZX81	Golf	16K	●	●	●	●	R3	'Similar to other golf games, in black and white'.
Helicopter	£24.95	Commodore Vic-20	Chop Lifter	8K	●	●	●	●	A3	Also on Commodore 64. Needs joystick to run. 'Vic version of USA's best-seller'.
Jigsaw	£14.99	Atari 400	British Heritage Jigsaw Puzzle	8K	●	●	●	●	T4	Also on Atari 800. 'Educational game with selective difficulty'.
Kong type	£7.95	Commodore Vic-20	Bonzo	8K	●	●	●	●	A3	'Workman dodges robots on split-level. Sound & full graphics'.

	£575.00	Apple II	Tabs Golf Package	48K	●	●	●	●	●	T3	Also on MS-DOS (64K). Maintains members handicaps including 1983 regulations.
	£28.18	Epson HX20	Horse Race Forecast	48K	●	●	●	●	●	K1	Also on Newbrain and Sharp. A punters aid to betting.
	£28.69	Sharp MZ80A	Navax	48K	●	●	●	●	●	K1	Also on MZ80K. Simulations of navigating a yacht on the English Channel.
Diary	£29.95	BBC Model A	Desk Diary	16K	●	●	●	●	●	W1	Also on BBC Model B. Consists of address book & diary planner (plus instructions).
Home budget	£19.99	Atari 400	Home Financial Management	8K	●	●	●	●	●	T4	Also on Atari 800. Needs Atari Basic cartridge. Aids money management.
	£19.95	Epson HX20	Home Budget	16K	●	●	●	●	●	K1	Also on Sharp. MZ80 & Osborne. Keeps records of home finances with graphics.
	£14.95	Sharp MZ80A	Sam Analysis	3K	●	●	●	●	●	S8	Designed for balancing home debits & credits.
Music composition	£24.99	Commodore Vic-20	Vic Music Composer	8K	●	●	●	●	●	T4	Aids to aspiring composer. Also for entertainment and education.
	£5.75	Spectrum	Music Maker	48K	●	●	●	●	●	B5	Teaches musical notation, aids composition.
Stock control	£10.00	Spectrum	Spec File	48K	●	●	●	●	●	A5	Stock control program useful in home, e.g. record collection, etc.
Various	£4.95	Spectrum	ZX Text	16K	●	●	●	●	●	S14	900-page colour teletext simulation with 24-hour clock etc.
	£12.95	Commodore Vic-20	Home Office	5K	●	●	●	●	●	A3	Comprises VicPro (word processor) & VicData (A database program).

UTILITIES

Basic	£201.25	CP/M	Basic 80	48K	●	●	●	●	●	L1	Industry standard Basic.
	£235.70	CP/M	Basic Compiler	48K	●	●	●	●	●	L1	Companion to Basic 80. Allows programs to run faster.
	£80.50	CP/M	BDS C Compiler	48K	●	●	●	●	●	L1	A subset of 'C' that enables its implementation. Includes symbolic debuggers.
	£121.90	CP/M	C Basic	64K	●	●	●	●	●	X1	Commercial Basic. Also on CP/M86 (£265.65).
	£213	Any Z80	X-Basic	48K	●	●	●	●	●	X1	Built-in matrix functions. Supports MP/M record locking. Graphics option.
Basic Upgrader	74.75	Commodore 64	VicTree	64K	●	●	●	●	●	S5	Also Commodore Vic-20. Also on floppy (£92.00). Adds 50 commands to Basic.
Card Index System	£215.05	Apple II	VisiDex	48K	●	●	●	●	●	R1	Also on IBM PC. Needs printer. One record/screen designed for cross-referencing.
	£178.25	CP/M	Cardbox	48K	●	●	●	●	●	C6	Also on MS-DOS. Needs 24 x 80 VDU & 100K disk storage.
Communications	£102.35	Apple II	ASCII Express — The Professional	48K	●	●	●	●	●	P4	Needs RS232. Asynchronous serial communications package.
	£448.50	Apple II	Editel	48K	●	●	●	●	●	O1	Needs modem. A Viewdata frame word processor designed to aid data editing.
	£826.75	Apple II	Owlysync 3780	48K	●	●	●	●	●	O1	A full IBM 3780 emulator package allowing communication up to 2400 Baud.
	£454.25	Apple II	Owitel	48K	●	●	●	●	●	O1	Needs modem. Allows access to Prestel & private viewdata systems.
	£149.50	Apple II	Terminal Utilities	48K	●	●	●	●	●	C1	Also on Apple IIE. Converts Apple II to intelligent terminal. Speeds of up to 9600 BPS.
	£57.50	CP/M	Xoopy 1.0	64K	●	●	●	●	●	X1	Disk copy utility for Cromemco machines. Copies 8" or 5 1/4" single/double sided.
	£454.25	CP/M	Micro-Linkline	64K	●	●	●	●	●	I2	Also on UCSD-P. Teletype comms for transferring datafiles.
	£575	CP/M	Bisync AC-3780	64K	●	●	●	●	●	E1	Also on MP/M & CP/M86. Micro to mainframe comms through IBM terminal emulation.
	£41.40	IBM PC	Asynchronous Communications	64K	●	●	●	●	●	I3	Needs asynchronous comms adaptor. Makes PC act as asyncs comms terminal.
	£117.30	IBM PC	IBM 3101 Emulation Program	64K	●	●	●	●	●	I3	Makes PC act as 3101 terminal provides 3270 emulations when connected to host.
	£938.25	IBM PC	PC SNA 3270 Emulation	128K	●	●	●	●	●	I3	Needs SDLL adaptor card makes PC act as IBM 3270 terminal.
	£22.43	Sharp MZ80A	Zen	48K	●	●	●	●	●	K1	Also MZ80K & B. Full Z80 editor/assembler.
	£115.00	IBM PC	Interlink	48K	●	●	●	●	●	T2	Also on Sirius, Apple II, Xerox, Osborne etc. Connects processors for downloading.
Database	£132.25	Apple II	DB Master	48K	●	●	●	●	●	M5	Available on hard disk. Allows 1K records over 100 fields. Report generation, etc.
	£224.25	Apple II	Informex Database System	48K	●	●	●	●	●	I1	Database system which can be used to & update info on any type of record.
	£402.50	Apple II	Mailist	48K	●	●	●	●	●	A4	Also for IBM PC & Corvus Concept. Requires hard disk. A networking product.
	£96.60	Apple III	PFS: File	48K	●	●	●	●	●	P6	Also for Apple II (£135.70). Used in tandem with PFS (£96.60).
	£217.35	Apple IIE	VisiTrend + VisiPlot	64K	●	●	●	●	●	R6	Also for CP/M. Graphic representation of data. Compatible with VisiCalc.
	£10.30	BBC Model B	Filer	16K	●	●	●	●	●	M7	Allows searching, sorting, saving & recovery of data.
	£201.25	CP/M	Dataflow II	56K	●	●	●	●	●	G1	Also on CP/M 86. Needs 160K disk space. Extract files to link with other systems.
	£295.00	CP/M	InfoStar	48K	●	●	●	●	●	M10	Also on IBM PC, MS-DOS. Integrates with WordStar and Calcstar.
	£201.25	CP/M	Datastaff	48K	●	●	●	●	●	X1	Data entry & retrieval system. Interfaces with WordStar
	£499.74	CP/M	dBase II	64K	●	●	●	●	●	E1	Micro DBMS. Can be used for high level programming for a range of applications.
	£557.50	CP/M	Suprefile	56K	●	●	●	●	●	S4	Multi-file database giving application package information.
	£166.75	CP/M	Supersort II16	64K	●	●	●	●	●	M10	A sort utility for handling various forms of data files. Mainframe-like additions.
	£1,840	CP/M	MDBS II	64K	●	●	●	●	●	T2	Also on CP/M-86, MS-DOS, Turbo DOS, Unix and Xenix. Mainframe-like facilities.
	£569.25	Commodore 8000	The Administrator	32K	●	●	●	●	●	S11	Applications generator. No programming involved.
	£68.42	Newbrain	Invoice & Credit Program	32K	●	●	●	●	●	E2	The invoice program allows you to put in your own information and design invoice.
	£29.32	Newbrain	Database 40/S	32K	●	●	●	●	●	E2	Information gatherer, stores large quantity of information & can be interrogated at will.
	£684.25	Sirius, IBM PC, MS DOS	Tomorrow's Office	128K	●	●	●	●	●	S11	Complete applications generator.
Debugger	£258.75	CP/M	Animator	64K	●	●	●	●	●	M11	Also on Unix & MS100S, interactive source level debugging tool for C/Cobol.
File Transfer	£132.25	CP/M	BSTAM	16K	●	●	●	●	●	L1	Needs common interface ports or modem access. Utility for transferring CP/M files.
Graphics	£34.50	Apple II	Graphic Utilities	48K	●	●	●	●	●	C1	Also for Apple IIE. Parameter driven machine code programs' high res graphics.
	£24.95	Atari	Constructor	48K	●	●	●	●	●	C8	Less experienced & new programmers can design animated sequences.
	£9.95	BBC Model A	Creative Graphics	16K	●	●	●	●	●	W1	Also for BBC model B.30 programs on cassette produce range of pictures & patterns.

	£24.95	BBC Model B	EDG Graphics Package	32K	●	●	●	●	S7	Computer aided design package. Reviewed 11.3.83.
Language	£50.60	CP/M	CP/M Graphics	64K	●		●		D4	Range goes up to £421.70 & conforms to GKS Graphics Standard.
	£488.75	CP/M	CIS Cobol	64K	●		●		M11	Also on Unix. Compact, interactive ANSI 74 standard implementation of Cobol.
	£1,109.75	CP/M	Level II Cobol	96K	●		●		M11	Also on Unix & MS-DOS. High level ANSI 74. Compiler, mainframe-compat code.
	£396.00	CP/M	Fortran 80	48K	●		●		T2	Useful for scientific applications, where Pascal is inefficient.
	£285.20	CP/M	Pascal — MT +	64K	●		●		X1	ANSI standard Pascal for Z80 processors. Also on CP/M 86 (£484-90).
	£210	CP/M	Supersoft C Compiler	48K	●		●		M4	Also on CP/M-86, MS/DOS, PC, DOS. Fast implementation of C.
	£1114.43	Commodore 64	DTL-Basic Compiler	32K	●		●		D1	Also on Commodore 8000, 4000 & 3000. Also tape version on CBM 64 (£39.96).
	£16.85	BBC Model A	Lisp on the BBC	16K	●		●		W1	Also on BBC Model B. Book available £7.50. Lisp is artificial intelligence language.
	£253.00	CP/M	ProPascal	56K	●		●		E1	Also on CDOS. Needs two disk drives. Native code Pascal.
	£40.19	Sharp MZ80A	Forth	48K	●		●		K1	Also on MZ80K & Osborne. Allows implementation of Forth.
	£25	Spectrum	Hisoft Pascal	48K	●				H5	Reviewed in PCW week ending April 8. Pascal compiler and screen editor.
	£421.70	Any 8 or 16 bit machine	PL/1	48K	●		●		D4	A compact implementation based on ANSI standard general purpose subset of PL/1.
	£350.75	IBM PC	Lattice-C	64K	●		●		L1	Also on MS/DOS. C' Compiler for 16 bit machines — full implementation & execution
Linker	£172.50	UCSD p-System	UCSD Pascal	48K	●		●		D4	Portable Pascal for systems development or commercial applications.
	£224.25	CP/M	Plink 2	48K	●		●		L1	Up to 8 megabytes.
Operations	£59.80	CP/M	Operating Guide	48K	●		●		E1	Works by putting CP/M to sleep & replacing it with operating environment.
Operating system	£22.94	Apple II	Fasdos	48K	●				P4	Disk operating system for Apples which speeds up location of binary & Applesoft files.
	£277	8086 micro	Concurrent CP/M-86	48K	●		●		T2	Enables four separate tasks to run in a single user station.
	£431.25	Many processors	UCSD p-System	48K	●		●		D4	Portable user-friendly operating system including one compiler.
	£295.20	8080 and Z80 micros	CP/M +	128K	●		●		D4	Upward compatible from CP/M enhanced 8-bit micro. O/S.
	£126.50	8080 and Z80 micros	CP/M 2.2	64K	●		●		D4	O/S for 8-bit micros with over 1.5 million users.
	£379.50	8080 and Z80 micros	MP/M	64K	●		●		D4	Multuser, multitasking. Features record & file locking, date & time stamping etc.
	£210.80	8086 and 8088 micros	CP/M-86	64K	●		●		D4	Manages up to one megabyte of RAM & allows up to 128 megabytes of on-line storage.
	£548.20	8086 and 8088 micros	MP/M-86	64K	●		●		D4	Multi-user. Multi-tasking. Multi-user capability with multi-programming for each user
	£168.70	8080, Z80, 8086 and 8088 micros	CP/Net	64K	●		●		D4	A CP/M compatible O/S designed to access local & networked resources.
	£295.20	Motorola MC68000	CP/M 68K	64K	●		●		D4	Extends CP/M to Motorola MC68000/microprocessors. Single user, single tasking.
Program Generator	£228.85	Apple II	Quickcode	64K	●		●		P4	Also on IBM PC. Program generator for dBase II.
	£126.50	CP/M	Forms-2	64K	●		●		M11	Also for Unix & MS-DOS. Programming tool, for generating Cobol code.
	£379.50	CP/M	Last One	64K	●		●		S3	Also on MS-DOS and Apple DOS.
Programming Tool	£2.500	Apple II	Pascal Isam/Pascal Form	48K	●		●		A4	Also on IBM PC & Corvus Concept. Needs Corvus hard disk. Pascal prog tool.
	£287.50	CP/M	Flieshare	48K	●		●		M11	Also on MP/M. Bank-switched memory or CP/M network.
	£7.95	Dragon 32	Dragon Selection 2	32K	●				D3	Four utility programs which can be listed to see how the program works.
Telex	£2,113.70	Superbrain	Micro Telex	64K	●		●		E1	Also on Teletideo 802. Enables automatic sending-receiving or telex by micro.
Testing Tool	£95.82	CP/M 80	Diagnostics II	32K	●		●		M4	Also on CP/M-86 and MS/DOS. Tests systems.
Time Recording	£862.50	Commodore 8000	Minuteman	32K	●		●		C4	Also on Commodore 4000. Time recording system. Can produce range or reports.
	£402.50	CP/M-86	Time Recording System	64K	●		●		D2	Also on CP/M 80. Control over man/hour expenditure by job or account number.
Utilities	£23.00	Apple II	Computech Utilities Disk II	48K	●		●		C1	Also on Apple IIe. Error checking, copying. Single disk copy. Label disk.
	£115.00	IBM PC	C-Food Smorgasbord	64K	●		●		L1	Decimal arithmetic, low level & terminal independent input & output.
	£79.35	CP/M	Visa 80	64K	●		●		M13	Constructs a menu-driven system to your design.

Computers, Nottingham 412777 **N5** Kobra Micro Marketing, Henley-on-Thames 2512

L1 Lifeboat, 01-836 9028

M1 MMS, Bedford 40601

M2 Microsimplex, Macclesfield 615000 **M3** McDowell Knaggs & Associates, Worcester 612261 **M4** Micro Technology, Tunbridge Wells 45433 **M5** MicroMed, 01-843 9457 **M6** Molimex, Exhill-on-Sea 223636 **M7** Micro Power, Leeds 6831186 **M8** Melbourne House, 01-977 9160 **M9** Mercury Software, Darwen 776677 **M10** MicroPro, 01-499 5777 **M11** MicroFocus, Swindon 695891 **M12** Microdeal, St Austell 67676 **M13** Mediatech, 01-903 4372

M1 Owl Microcommunications, Bishops Cleeve 723848 **M2** Omicron, 01-636 6575

P1 Peachtree Software International, Maidenhead 32711 **P2** Padmade, Fleet 21892 **P3** Pegasus, Kettering 522822 **P4** Pete & Pam Computers, 01-769 1022 **P5** PE Consulting Group, Egham 34411 **P6** Personal Computers, 01-377 1200 **P7** PTRC, 01-836 2208

P8 Printrity, 02407-4306

Q1 Quicksilver, Southampton 20169

R1 Rapid Terminals, High Wycombe 26271 **R2** Rabbit Software, 01-863 0833 **R3** R & R Software, Gloucester 502819

S1 Systemsatics International Microsystems, Haverhill 61121 **S2** SGS Software Products, 01-486 7498 **S3** Silicon Valley Trade, 01-242 2807 **S4** Southdata, 01-393 6477 **S5** SuperSoft, 01-861 1166 **S6** Seed, Bromliss 378151 **S7** Salamander, Brighton 77771942 **S8** Solo Software, Worcester 424152 **S9** Silversoft, 01-748 4125 **S10** Sinclair Research, Cambridge 333204 **S11** Stage One Software, Poole 735656 **S12** SBD Software, 01-870 9275 **S13** Starcade, 051-236 6628 **S14** Iain Stewart, 0259-60840

T2 Tamsys, Windsor 56747 **T3** Tabs, Andover 5893 **T4** Thron EMI, 01-836 2444 **T5** Texas Instruments, Bedford 63211

W1 Xitan Wiley & Sons, Chichester 784531 **W2** Wridgit Software, 01-444 5285

X1 Xitan Systems, Southampton 334711

A1 ACT Pulsar, 021-454 8585 **A2** Advanced Quality Software, Norwich 21117 **A3** Audiogenic, Reading 595647 **A4** Atlantic Software, Nottingham 412777 **A5** & F Software, 061-223 6206 **A6** Abbex Electronics, 01-203 1465 **A7** Automata UK, Portsmouth 735242 **A8** Apex Trading, Brighton 36894 **A9** Accornsoft, 01-379 6502 **B1** Borsal, 01-580 0902 **B2** Bristol Software Factory, Bristol 23430 **B3** Bug-Byte, 051-227 2299 **B4** Bytesoft, 0480-215005 **B5** Ballflower software, 01-903 1816
C1 Computech Systems, 01-794 0202 **C2** Compact Accounting, Dorking 887373 **C3** Claremont Controls, Rothbury 21081 **C4** Computer Services Midlands, 011-382 4171 **C5** Comshare, 01-222 5665 **C6** Caxton Software, 01-379 6502 **C7** Cyderpress, Wainfording 2769 **C8** Channel 8 Software, Preston 53057 **C9** Chalksoft, Wellington 7117 **C10** Construction Computing Services, Blyfield 47541
D1 Dataview, Colchester 869414 **D2** DEC, Basingstoke 59200 **D3** Dragon Data, Kenfig Hill 744700 **D4** Digital Research, Newbury 3535304 **D5** Dipar Software, 0329 46756
E1 Encolet Systems, 01-688 9687 **E2** Elstree Computer Centre, 01-953 6921 **E3** Ferrari, 01-751 5791 **F2** Farplann Computer Systems, Ross-on-Wye 64321
G1 Great Northern, Leeds 59980 **G2** Graffcom Systems, 01-727 5561 **H1** Hilderbey, 01-485 1059 **H2** Hartford Software Northwich, 781156 **H3** H & H Software, Runcorn 65566 **H4** Heinemann, 01-637 3331 **H5** Hisoft, Swindon 26616
I1 Informex, 01-318 4213 **I2** Intelligence (UK), 01-543 3711 **I3** IBM UK Product Services, Basingstoke 56144 **I4** IJK Software, Blackpool 21555 **I5** Impact Software, 031-441 4257 **I6** Imagine Software, 051-236 6849
J1 Jarman Systems, Tiring 6841
K1 Kuma Computers, Mordenhead 71778 **K2** Kansas City Systems, Chesterfield 850357 **K3** Knights, Aberdeen 630526 **K4** Keen

Wanted, any Vic 20 software. R. Chamber, 38 Station Rd., Woburn Sands Milton Keynes. Send details of what programs you have, price wanted and your tel no.

READER

8-track cassette adaptor, never used, in box, £5. Tel: 01-211 3192 day, 01-993 3123 eve.

Acorn Atom 12K + 12K, excellent condition, only four months old, lots of software including organ tape cost £240 everything for £180 o.n.o. Tel: Sanjay, Leicester (0533) 58840 after 4pm.

[illegible]

Acorn a-plenty at the launch

Acorn officially launched its £199 Electron with an educational presentation that would have put Janet and John to sleep.

To help us swallow the clichés of the show there were green Electron cocktails.

The films about what the Electron can do in the home were peppered with technical *faux pas*.

An actress, for example, was shown in one film clip 'accessing

a database' of her at-home files using the Electron, with the results of her home spreadsheet appearing immediately on-screen.

This would have been credible had some form of storage device been at least visible in the picture, but considering that the bare Electron in the film had no disk drive or even tape recorder to recover the results of this supposed database, the credibility gap was enough to drive an Acorn delivery truck through.

A movie-ing experience

Despite the best efforts of software producers, games aren't yet two a penny, but the day isn't far off. So when a company has a new game on sale it has to find a new way of tarring the game up to make it stand out from the rest.

Silly Software has made a good start by choosing such a witty company name. The name of its first game, *Movie Producer*, isn't quite as witty

but even Oscar Wilde had his occasional off days. Besides, *Movie Producer* has more for it than a mere going name.

According to Silly Software (SS) 'it has a theoretical 25 billion levels of play'. Assuming that the movie you're producing isn't *Heaven's Gate* or *Renaldo and Clara* (seven hours plus each), assuming in fact that it is just a 30 second ad for Channel Four, it will take you approximately 23 years and nine months of continuous play to enjoy the game in all its intricacies.

SILLY SOFTWARE ERRORS

Left hanging

Price and availability details for the Suspended game from Infocom for the Commodore 64, missed out last week, are as follows:

Name Suspended **System** Commodore 64 **Price** £34.94 **Publisher** Infocom, 55 Wheeler Street, Cambridge, Massachusetts, 02138 **Format** Disk **Language** Machine code **Other versions** Apple, Atari, Texas, IBM, TRS80 **Outlets** Carousel Software, 36 Harlow Park Crescent, Harrogate HG2 0AW.

NEXT WEEK

● **Micropaedia** — PCN starts a three-parter on the Dragon 32.

● **Hardware** — Look Sharp with a full Pro-Test of the new MZ 700.

● **Software** — Is there room for Lisp on the BBC?

● **Peripherals** — Memory interfacing on the ZX81: how to make the most of 1K.

● **Plus news, letters, tips, program cards, book reviews...**

PAL2000
by Mollusc.

Have you done
the income tax
calculations?



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
First Hampshire Computer Fair	Sep 8-9	Southampton Guildhall	Testwood Exhibitions, 33/34 Oxford Street, Southampton, 0703 34020
Video, Audio and Computer Show	Sep 16-18	Bradford Exposition Centre	R. Cooper, J. Wood & Sons Ltd, Bradford 720014
BBC Micro User Show	Sep 16-18	Sherwood Rooms, Greyfriar Gate, Nottingham	Database Publications, 061-456 8383
Second National British Osborne Owners' Group Meeting	September 17	National Liberal Club, 1 Whitehall Place, London SW1	Dr J. Anglesea, 021-472 1311 Ext 275
Home Entertainment Show	Sep 17-25	Olympia, London	Montbuild Ltd, 01-486 1951
Kent Apple Village	September 18-21	Stour Centre, Ashford, Kent	Database Publications, 061-456 8383
Computer Open Day Exhibition	September 22	Central Hotel, Glasgow	Couchmead Communications Ltd, 01-778 1102
Microcomputers in Business	Sep 27-29	Warwick University, Coventry	Peter Bubb, 01-892 4422
IWP one-day workshop	Sep 29	City Conference Centre, 76 Mark Lane, London EC3	Quadrilect, 3 Courtfield House, Baldwin Gardens, London EC1, 01-242 8697
Personal Computer World Show	Sep 29-Oct 2	Barbican Centre, London	Montbuild Ltd, 01-486 1951
Computer Fair	Oct 2	The Sir Frederic Osborn School, Welwyn Garden City	R Brown, Welwyn Garden City 23367

OVERSEAS EVENTS

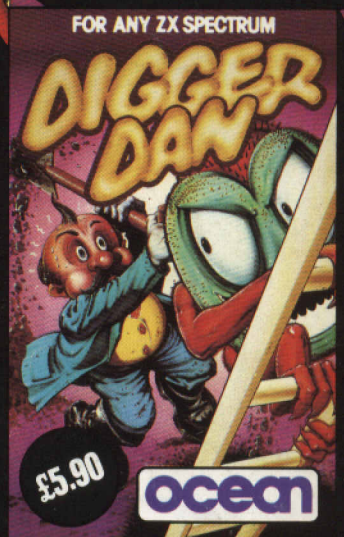
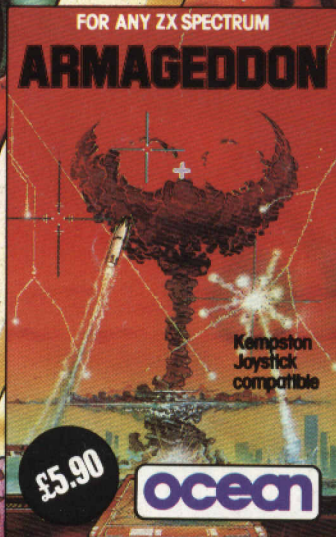
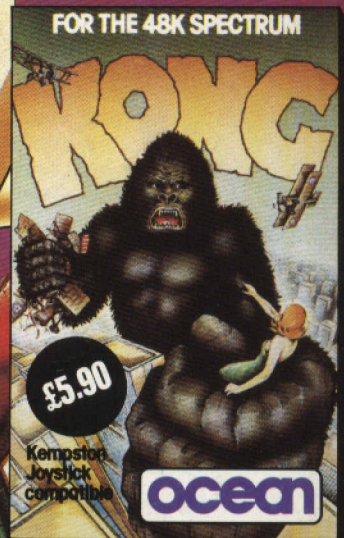
Event	Dates	Venue	Organisers
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic 3205
International Peripheral Equipment & Software Exposition	Sep 13-15	Moscone Centre, Anaheim, USA	Cahners Exposition Group SA, 0483 38085
Computex	Sep 20-22	Limerick, Republic of Ireland	SDL Exhibitions, Dublin 763871
Info '83	Oct 10-13	New York, USA	Cahners Exposition Group, 0483 38085
Computer Systems International Trade Fair & Congress	Oct 17-21	Munich, West Germany	ECL Exhibition Agencies, 01-486 1951

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